Cement MILL SECTION of

Concrete

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How Henry Ford Makes Cement

By Dwight F. Jennings

Henry Ford thinks in a straight line. In many different industries he has revolutionized production methods, while experts trained in those industries have been insisting "it can't be done." So his recent entry into the cement field will be witnessed with considerable interest, even though he may have no intention of putting his cement on the market.

In this account of Mr. Ford's cement manufacturing operations, the writer has been careful not to omit any important technical detail and has preserved for the reader, his own personal impressions of many features that give to the Ford cement plant a great deal of human interest.

No one but Henry Ford would paint a slurry tank with pigment selected to match the slurry drippings!

Doubting Thomases who do not believe that a cement plant can be made a dustless place should visit Henry Ford's cement plant at River Rouge, Mich., (a suburb of Detroit) and see that Mr. Ford was not only convinced that a cement plant could be operated without dust, but has now actually proved it. By dust-proof equipment, Mr. Ford does not mean merely commercially dust proof, as some of the manufacturers believed when their equipment was first installed, but dust proof in its absolute sense.

The first consideration at the Ford cement plant is absolute protection for human life, then the plant must be absolutely dustless, and third in consideration is production. The first cost is not taken into consideration where safety or cleanliness is involved. The matter of cost will be worked out eventually with increased production.

The idea of running a cement plant like a bakery was influential in bringing about the adoption of the wet process, making the Ford plant the only wet process cement plant of its type in the world using blast furnace slag as raw material. Where dust might be inclined to tarry, there is a man with a brush ever ready to collect it, so that, after making a tour of the entire cement plant, including the coal mill, and inspecting the equipment the greater part of a day, you come out with your hands as clean as if the time had been spent at an office desk. Interested visitors are accompanied to the cement plant by a Ford guide, and then conducted through the plant without preliminaries. There is no donning of dusters and caps before starting to see how Henry Ford makes cement. If you desired, you could wear your dress suit and white gloves without fear of damaging them, and come out of the plant without even needing a shoe shine, after traveling up and down painted iron stairs, over dustless concrete floors, and rubbing up against compeb mills and coal pulverizers. How to make conveyor and elevator and fan housings dust tight was worked out after the equipment had been tried out and found to spout dust in the usual manner from seams and openings. Electric welders were set to work welding all seams and joints that could be closed permanently, and where it was necessary to leave movable covers to allow access to the interior of the equipment, compressible gaskets were provided, and the plates or covers are held firmly in place by screws or bolts, making dust tight joints.

The Plant

The Ford cement plant is a unit in the River Rouge plant of the Ford Motor Co. The present capacity is 1000 bbls. per day, with one kiln installed. The foundations are already in for another kiln and the necessary equipment to double the output. The power used in operating the plant amounts to about 1200 h.p., making the consumption approximately 1¼ h.p. per bbl.

The main building is virtually a three-story structure of permanent construction. All buildings, as shown in Fig. 1, have structural steel framing, reinforced concrete floors, gunite walls and tile roofing. The stockhouse is of the silo type built by the sliding form method. In designing the plant layout, the engineers were allotted a certain piece of ground—like a large percentage of the Rouge site, reinforced by thousands of piles driven into the marshy ground—and were told that the cement plant was to be confined within

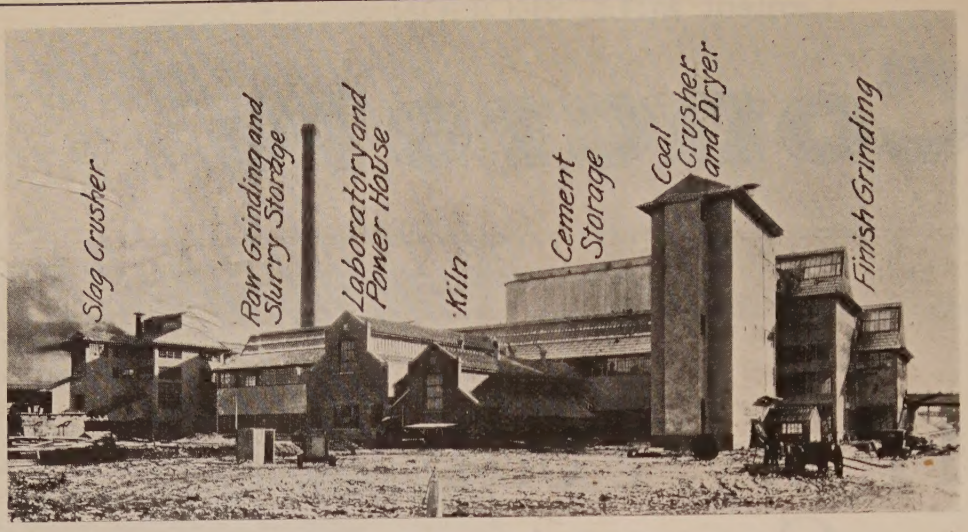


FIG. 1—GENERAL VIEW OF THE WET PROCESS CEMENT PLANT OF THE FORD MOTOR CO. AT RIVER ROUGE, MICH.

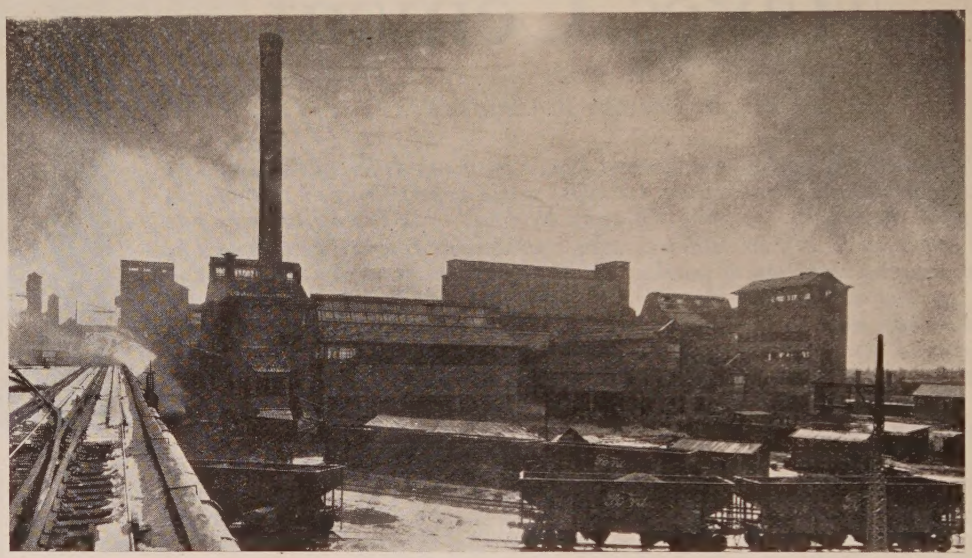


FIG. 2—GENERAL VIEW OF THE FORD CEMENT PLANT LOOKING SOUTHWEST FROM THE RAILROAD TRESTLE. THE SILO STORAGE AND PACKING PLANT APPEAR IN THE CENTER BACKGROUND

those definite limits. The accompanying plan shows how efficiently the layout was arranged.

RAW MATERIALS

The raw materials used are slag and limestone. Owing to the nature of the slag used, very little, if any, gypsum is required to regulate the setting properties of the finished cement. The slag comes from the Ford blast furnace, and the limestone from the Ford quarries.

As the molten slag runs from the blast furnace, a stream of water is forced through it, causing the slag to granulate. The mixture of granulated slag and water is forced into the sump of a centrifugal pump. The mixture, which is from 80% to 90% water, is then pumped 1300 ft. through a manganese steel pipe to a receiving pit in the cement plant. As it is received in the pit, it is somewhat cellular in structure, and much of it floats on the water.

From the pit, the slag is dipped up by the perforated buckets of a Luhrig de-watering elevator[1] and the surplus water drained off. When it stops dripping, the slag contains about 25% water. The buckets of the elevator hold about 200 lb. of dry slag each, and travel at a speed of about 15 ft. per minute. This elevator is similar to the de-watering elevators used in coal washeries. All bearings and main wearing surfaces are of manganese steel, which adds materially to their life.

The slag is next deposited on a belt conveyor[1] with terminals about 35 ft. o. c., equipped with a Dings magnetic separator[2] for removing all tramp iron. This discharges onto another rubber belt conveyor,[1] about 80 ft. long, from which the slag is scraped off by plows into either of the storage bins as desired.

The slag storage bins hold about 150 tons each, and the bins are filled by successions of runs, referred to as flushes, in order to mix the slag properly. A Peck carrier[1] draws the slag from the bottom of the bins and conveys it to the hoppers of the raw grinding mills.

The limestone, which is shipped in either by rail or boat, is screened, and the sizes ranging from 2 in. to 8 in. are used in the blast furnace. The 1-in. to 2-in. sizes are used in the foundry cupola, and the fines, under 1 in., are conveyed from the screens to the cement plant on belt conveyors discharging into the grinding mill bins.

The raw materials are proportioned approximately and ground with the addition of water into a slurry containing about 30% water. A constant supply of water under uniform pressure is insured by drawing the water for the slurry from a storage tank which is kept full to overflowing by a pipe connected to the plant water mains. In this way, all fluctuations in pressure in the main system are compensated.

The raw grinding is done in an Allis-Chalmers

[1]Link-Belt Co., Chicago, Ill.

[2]Dings Magnetic Separator Co., Milwaukee, Wis.

compeb mill[3], 7 ft. in diameter and 22 ft. long, driven by a 400 h.p. Allis-Chalmers synchronous motor operating at 4600 volts. The motor drive is equipped with a Cutler-Hammer magnetic clutch[4]. When the slurry is ground to a fineness of 90% through a 200 mesh sieve, it enters the steel slurry tanks, where it is kept agitated and analyses made.

The slurry is pumped from the raw grinding mill by

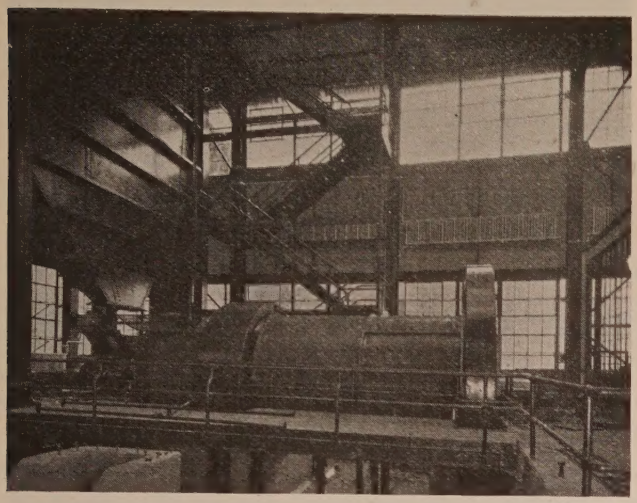


FIG. 3—RAW GRINDING COMPEB MILL, 7 FT. IN DIAMETER, 22 FT. LONG COMPLETELY GUARDED BY SCREEN AND SHEET METAL GUARDS. On the right in a separate room, is the 400 h.p. motor which drives the compeb mill through a magnetic clutch. This picture also illustrates the type of building construction in the entire plant

two Allis-Chalmers compressed air pumps into the six slurry storage tanks having a combined capacity of 3600 bbls. of cement material.

These tanks are each 20 ft. in diameter and 20 ft. high, with a 10-ft. hopper bottom holding slurry for 600 bbls. of cement. The tanks are agitated by a combination of compressed air and mechanical means.

From the storage tanks, the slurry flows by gravity into the correction tanks, of which one is provided for each kiln. These tanks are of reinforced concrete, 22 ft. in diameter and 16 ft. deep, and are agitated both by compressed air and mechanical equipment. From the correction tanks, the properly mixed slurry is pumped to the small feeder tank over the kiln to be fed to the kiln and all burned to hard clinker.

COAL

The coal used for firing the kiln is shipped in by rail over the Ford railroad from the Henry Ford mines in Kentucky. It is of excellent quality for cement manufacturing, analyzing 6 to 8% ash and 36% volatile.

Mostly slack coal is received at the cement plant, but an emergency coal crusher is installed—a single roll Link-Belt crusher[1]— for crushing any lump coal received. From the pit into which the coal cars dump, a belt apron conveyor[1] elevates the coal to the dryer bins, from which it is fed to the specially built Ford hot air coal dryers of the vertical type.

There is no fire in the coal building or driers, the circulating air being heated mainly to a constant temperature by steam coils. This relieves the danger from fire. The efficiency of the coal dryers is increased by the use of hot air collected by an apron or hood 25 ft. long over the firing end of the kiln and conducted by a Sturtevant fan[5] and large diameter pipe to the coal building. Hot air from the clinker cooler is also utilized in a similar manner.

[3]Allis-Chalmers Co., Milwaukee, Wis.
[4]Cutler-Hammer Mfg. Co., Milwaukee, Wis.
[5]B. F. Sturtevant Co., Boston, Mass.

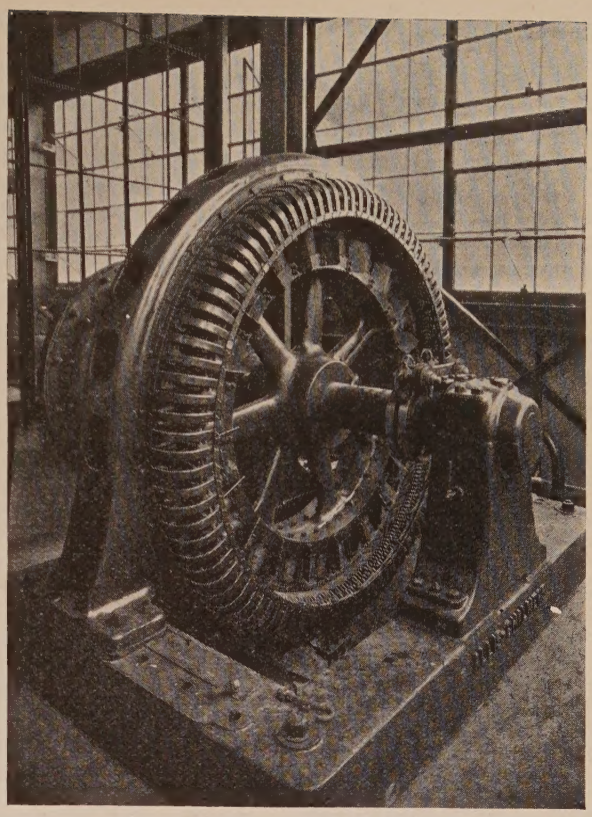


FIG. 4—400 H.P. ALLIS-CHALMERS SYNCHRONOUS MOTOR WHICH OPERATES THE RAW GRINDING COMPEB MILL. On the left is shown the Cutler-Hammer magnetic clutch. This motor has been enameled a brilliant red and reassembled and completely covered, together with the clutch and all rotating parts, with enameled screen guards

"Whose ideas are these?" we asked a man about the plant who knows. "They are Henry Ford's ideas—anybody who gets the notion that Mr. Ford personally doesn't originate these things is wrong. He comes in at unexpected times; he sees everything; an empty pail or a piece of timber out of place spoils his visit; he wants order, cleanliness, and safety, and he, himself, knows how to get them."

The appearance of the loose bolts shown in the foreground of the above picture would undoubtedly distress Mr. Ford.

The dried coal is conveyed to the bins over the pulverizing mills by a screw conveyor, which is so arranged as to discharge through various openings into dust-tight spouts to the bins below. This screw conveyor, with its dust-proof, sliding gates in the discharge openings and electrically welded cover, replaces an original installation of belt conveyor, and goes a long way toward keeping the coal grinding department free from dust.

Two Raymond coal mills[6] have been installed, and when the second kiln is put in operation there will be three pulverizers, so as to allow one auxiliary. These mills are governed automatically by automatic feed

[6]Raymond Bros. Impact Pulverizer Co., Chicago, Ill.

controls working with the vacuum from the exhaust fan.

The coal is fed into the firing end of the kiln by Sturtevant No. 8 blowers[5]. The two compressors installed are Ingersoll-Rand air compressors[7]. Both compressors are motor driven; combined, they furnish all the air used in the plant for cooling, blowing out motors and agitating slurry. One is a high-pressure compressor with 1000-cu. ft. capacity operating at 100 lb. pressure, and the other is a 2500-cu. ft. low-pressure compressor operating at 50 lb.

> The slurry tanks have been painted a color that exactly matches the slurry, so that there is no evidence of the material on the outside of the tanks. A painter was assigned the job of mixing a paint to match the slurry in color.

The kiln[3] is 10 ft. in diameter and 150 ft. long, with a 6-in. fire brick lining backed by Sil-O-Cel insulation[8]. For 30 ft. at the firing end, the lining is of Superfax[9] high alumina brick. The remainder of the lining is of Harbeson-Walker fire brick[10]. The brick in the lining were all fitted dry, and then grouted in, so as to insure a rigid lining.

An interesting feature in connection with the kiln is the apron over the firing end, as shown in the accompanying illustration. This collects the hot air which would rise above the kiln, and from the hood, which covers about 25 ft. of the kiln, the hot air is conducted through the large pipe shown to the coal drier. Thus the heat is utilized and the kiln room temperature kept down and the room ventilated.

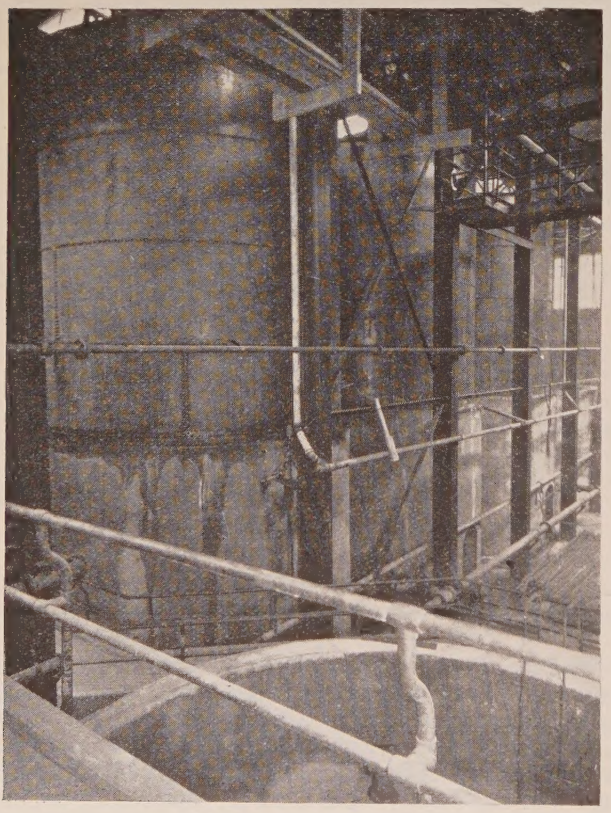


FIG. 5—VIEW SHOWING PART OF THE 6 SLURRY STORAGE TANKS EACH HAVING A CAPACITY OF 600 BBLS. OF CEMENT MATERIAL. These tanks are 20 ft. in diameter, 20 ft. high and have 10-ft. hopper bottoms. This view was taken during construction and before the tanks had been painted to correspond in color with the slurry

[7]Ingersoll-Rand Co., Milwaukee, Wis.
[8]Celite Products Co., New York City.
[9]Laclede Christy, St. Louis, Mo.
[10]Harbeson-Walker Refractories Co., Pittsburgh, Pa.

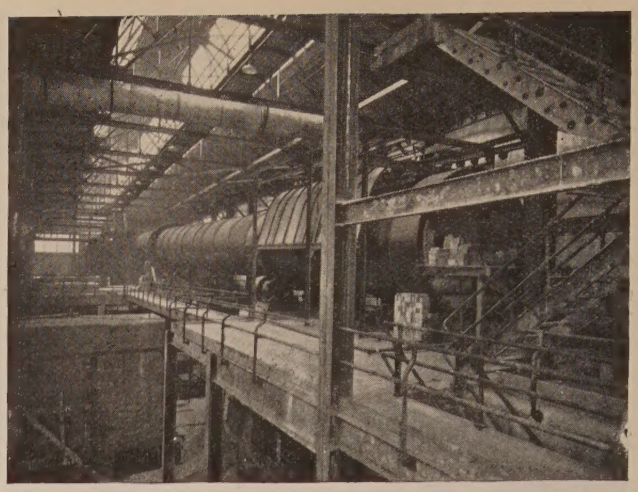


FIG. 6—INTERIOR VIEW OF THE KILN BUILDING WITH ONE KILN INSTALLED AND THE FOUNDATION IN FOR THE SECOND ONE. The apron for taking away excess heat from the firing end of the kiln is about 25 ft. long. The kiln is 10 ft. in diameter and 150 ft. long, driven by 50 h.p. motor through bevel gears and silent chain drive. This picture shows the type of construction of the mill building and was taken before construction work was entirely completed and the interior painted

The coolers discharge onto a Peck carrier, which elevates the clinker about 60 ft. to a belt conveyor over the clinker storage. This belt conveyor is a 5-ply rubber-covered belt, 30 in. wide and 80 ft. o. c. A Merrick weightometer[12] automatically records the clinker discharged into storage over the conveyor, and a traveling tripper[1], which is a part of the conveyor equipment, is set to discharge the clinker at any point as desired.

Belt conveyors operating in tunnels underneath the clinker storage reclaim the seasoned clinker and carry it to the grinding mill bins. As the Peck carrier from the cooler to the clinker storage passes over the grinding mills, a dumper on the carrier can be set to discharge the clinker directly into the grinding bins.

What gypsum it is necessary to use with the clinker is reclaimed, being handled similarly to the coal, and conveyed from the crusher pit to the clinker grinding department. The gypsum comes as a waste product from the Ford glass plant.

Finish grinding is done in a 7-ft. x 26-ft. compeb mill[3] driven by a 500 h.p. a. c. motor[3], connected like that of the raw grinding unit. One compeb mill is provided for each kiln. The finished cement from the compeb mill goes to the storage bins through bucket elevators and screw conveyors, a conveyor at the top of the stockhouse distributing cement to the various bins. The conveyor and elevator pipes are made dust tight by electric welding along all seams.

STOCKHOUSE

The silo stockhouse for finished cement, as shown in the accompanying illustration, consists of 10 bins with interspaces constructed by the Macdonald Engineering

[11]Frederick Engineering Co., Frederick, Md.
[12]Merrick Scale Co., Passaic, N. J.

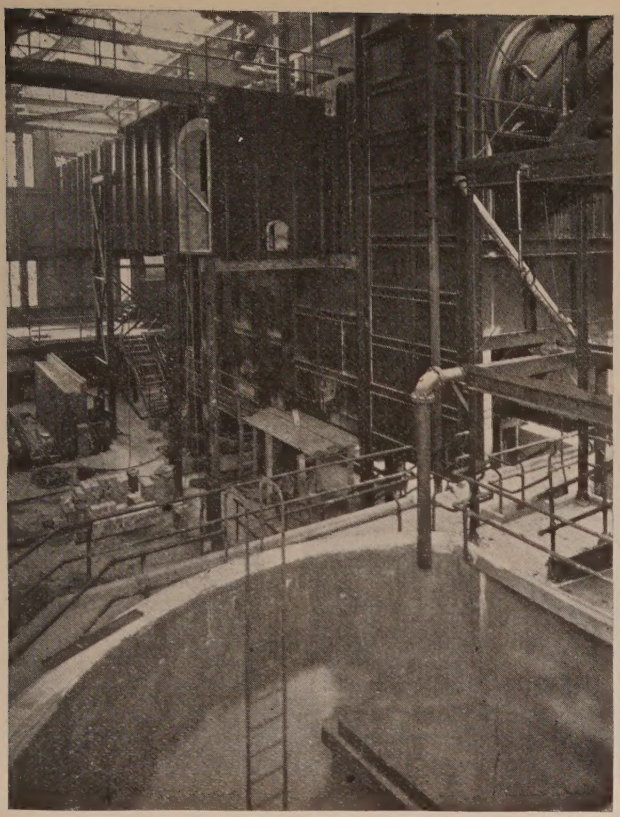


FIG. 7—VIEW SHOWING THE FEED END OF THE KILN, THE LADD WASTE HEAT BOILER AND A PART OF ONE OF THE CORRECTION TANKS IN THE FOREGROUND

Co., by the sliding form method. The silos are 25 ft. in diameter and 80 ft. high, with a capacity of 10,000 bbls. each. The total capacity of the storage plant is 120,000 bbls. of cement The bins are surmounted by the conveyor house with numerous openings for ventilation.

Each bin is equipped with rotary feeders, and screw conveyors and bucket elevators reclaim the cement and carry it to the bins over the Bates packers[13]. Provision is made for the use of compressed air to break up any arches that may be formed by the cement in the bins, and the special rotary feeders prevent any flooding of conveyors by regulating the

[13]Bates Valve Bag Co., Chicago, Ill.

In cases where the original gear guards were made of sheet metal bent to form part of a polygon with a number of equal sides and angles, Mr. Ford immediately directed that the original guards be replaced by others bent to form smooth circular curves.

amount of cement withdrawn from the silos. A screen over the packer bins removes all foreign material, such as bolts and nuts that might get into the cement, and chutes it outside.

The two 3-tube packers are equipped with exhaust fans to carry away any cement dust from the operators. Each packer has a capacity of 900 sacks per hour. The sacks are loaded into cars on the track alongside the packing house by a traveling belt conveyor[14].

POWER HOUSE

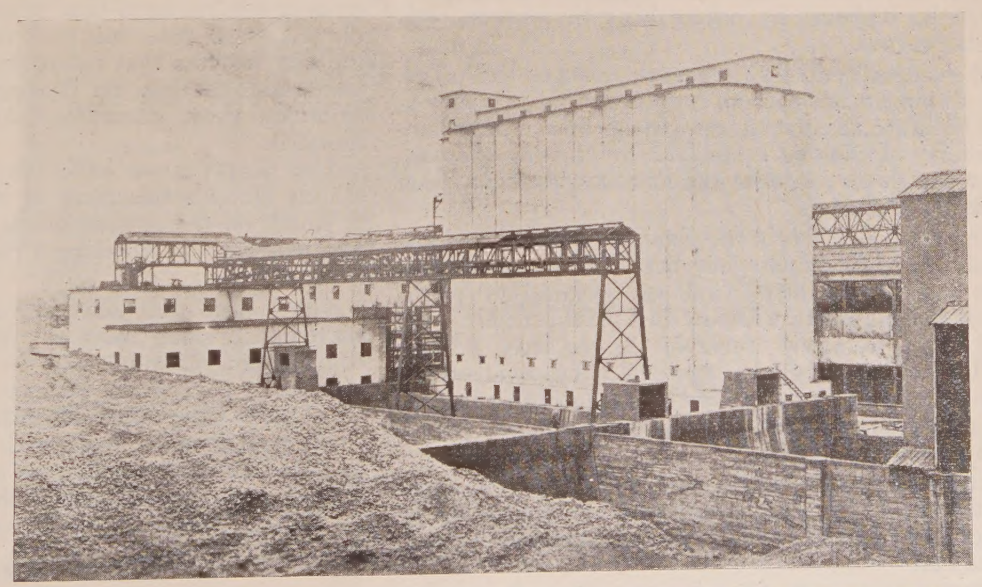
The power house contains two 750-k.w. Ford turbo-generator units, built in the Ford Motor Co.'s shops. Electrical power is generated by utilizing the waste heat from the kilns, and the power house equipment is hooked up so excess power needed in operating the plant comes from the main Ford power plant.

The plant is equipped with an 800 h.p. Ladd waste heat boiler[15] for one kiln. This is a vertical boiler with a 250% rating equal to 2000 h.p. at 250 lb. pressure. The waste heat installation is equipped with a Sturtevant economizer[5], a super heater[16] for steam and Vulcan mechanical soot blowers[17].

All equipment is motor driven, by individual motors. With the exception of two large motors[3] for driving the compeb mills, the motors are all General Electric equipment[18]. The kiln motors are rated at 50 h.p. and installed in duplicate. The kiln fans are also installed in duplicate. When the installation of the second kiln is completed, there will be three motors for the two kilns, leaving one motor as an auxiliary to drive either kiln as an emergency necessitates. The kiln drive is

[14]H. W. Caldwell & Son Co., Chicago, Ill.
[15]Geo. T. Ladd Co., Pittsburgh, Pa.
[16]Superheater Co., Chicago, Ill.
[17]Vulcan Soot Cleaner Co., DuBois, Pa.
[18]General Electric Co., Schenectady, N. Y.

FIG. 8 — 120,000-BBL. STORAGE AND PACKING PLANT WITH THE CLINKER STORAGE AND ELEVATED CLINKER CONVEYOR IN THE CENTER FOREGROUND



a combination of silent chain and bevel gears. Other silent chain drives are in use on the Raymond mills.

Laboratory

All laboratory equipment is electrical, including a still, drying ovens, and hot plates[19]. The built-in settings are of acid-proof, high temperature tile. As shown in the accompanying illustration, the briquette tanks are of tile. The chemical laboratory is equipped with an exhaust fan for ventilating. Included in the laboratory equipment are machines for testing both compressive and tensile strengths. All regular laboratory equipment is included, except stools, of which the laboratory and office have none. One chair is supplied in the office.

Laboratory ovens and plates were furnished by the Hoskins Mfg. Co., Detroit, Mich. A compression testing machine was furnished by the Pittsburgh Testing Laboratory, Pittsburgh, Pa., and the tensile machine by Riehle Bros., Philadelphia, Pa. High temperature tile in the laboratory was installed by Martin Gibson Co., Detroit, Mich.

Safety First

"Safety First" comes first in the Ford cement plant. Mr. Ford insists upon absolute safety to his employes —absolute protection for human life. The extent to which this policy has been carried out can be realized only by a trip through the plant. All revolving parts are entirely enclosed by sheet metal guards or screens. The illustration showing the compeb mill gives a clear idea of how the entire grinding machine has been enclosed. The motors driving the compeb mills and the connecting magnetic clutches are entirely enclosed in screen guards. These guards have not only to be serviceable but sightly. In cases where the original gear guards were made of sheet metal bent to form part of a polygon with a number of equal sides and angles, Mr. Ford immediately directed that the original guards be replaced by others bent to form smooth circular curves.

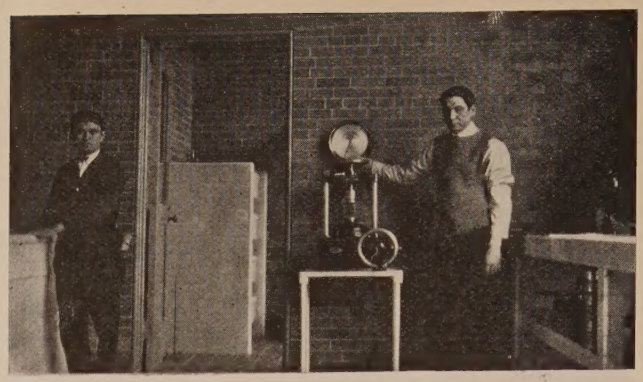
> They tried to get Mr. Ford to put the word "portland" in his brand name. He would have none of it. "Ford Cement," he insisted, on a Ford radiator design, and the tables giving the complete analysis on the outside of each sack.

All electrical control switches are arranged fool-proof. The equipment has been so connected that it is impossible to start the wrong equipment first. Thus any possibility of choking a machine by starting the conveyor that feeds it before the machine itself has been started is precluded.

Working conditions in the plant are improved by the cleanliness. Cleanliness has been advanced to rank with, and not second to, Godliness in the Ford plant, and a cement plant without dust is the result. All hand holes in screw conveyor covers have screens rigidly attached to the casings under the cover plates, so that, even after the covers are removed for inspection purposes, workmen are protected from the danger of the revolving screws.

Numerous unique features are to be noted throughout the plant. Automatic samplers are distributed at the proper points to obtain average samples for any bin or run.

[19]Hoskins Mfg. Co., Detroit, Mich.



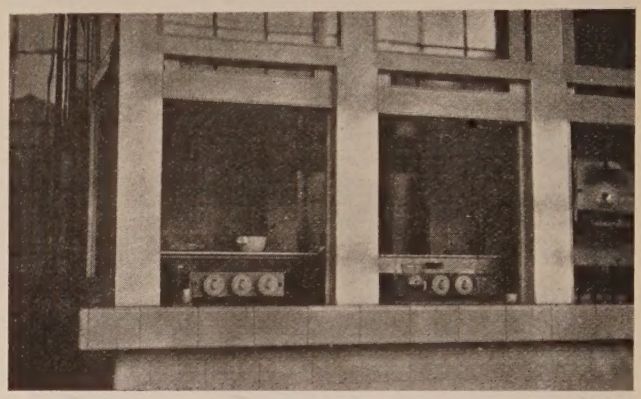


Fig. 10—Interior View of a Section of the Laboratory with the Glazed Tile Briquette Storage Tanks in the Background
Fig. 11—Electrically Operated Laboratory Equipment with Acid-Proof Glazed Tile Setting

Air valves with pipes connecting with the main pressure supply and water inlets are provided on either side of the main valves in the slurry pipes to permit cleaning out the pipes and valves.

Exhaust fans and dust collectors, built in the company's shops, are installed in all otherwise dusty places in the buildings. There are two vent pipes in the roof of the coal building and two over the Raymond mills. As mentioned previously, all powdered coal and other dust is prevented from spouting from the elevators and conveyors as a result of the pipes housing the buckets and screws having been made dust tight by electric welding.

The kiln, originally painted a dark green color, is now painted with aluminum paint, as that is the only paint that will stand the heat. Whether or not the reduction in radiated heat from the kiln as a result of the aluminum paint has been taken into consideration, the fact remains that recent experiments with various paints and coatings for heating radiators proved that aluminum paint materially reduced the amount of heat radiated.

The slurry tanks have been painted a color that exactly matches the slurry, so that there is no evidence of slurry on the outside of the tanks. A painter was assigned the job of mixing a paint to match the slurry in color.

The motors that drive the compeb mills—each installed in a small room by itself with the necessary controlling apparatus—and the protecting screens that completely cover them are enameled a bright red. The outer parts were taken off, enameled and reassembled.

All steel bins are lined with Gunite as a protection against wear from the passing materials. This Gunite, as well as the Gunite walls of the buildings, was applied by Hanna, Zabriskie and Daron, Detroit, Mich.

Plant Operation

As operated, the plant requires about 150 men, the

The Plant Occupies Part of a Plot of Ground Approximately 440 ft. North and South by 496 ft. East and West. The East and West Dimension is From the Center of the Pier Leg Wall at the Bottom of the Figure to the Dock Face at the Slip. The North and South Dimension is the Over-All Distance from the Track Hopper on the Right to the Extreme End of the Retaining Wall at the Lower Left, North Being Towards the Right in the Figure. Provisions Have Been Made for Doubling the Capacity of the Plant, Foundations for the Second Kiln Unit Having Been Built and Future Cement Storage Provided for

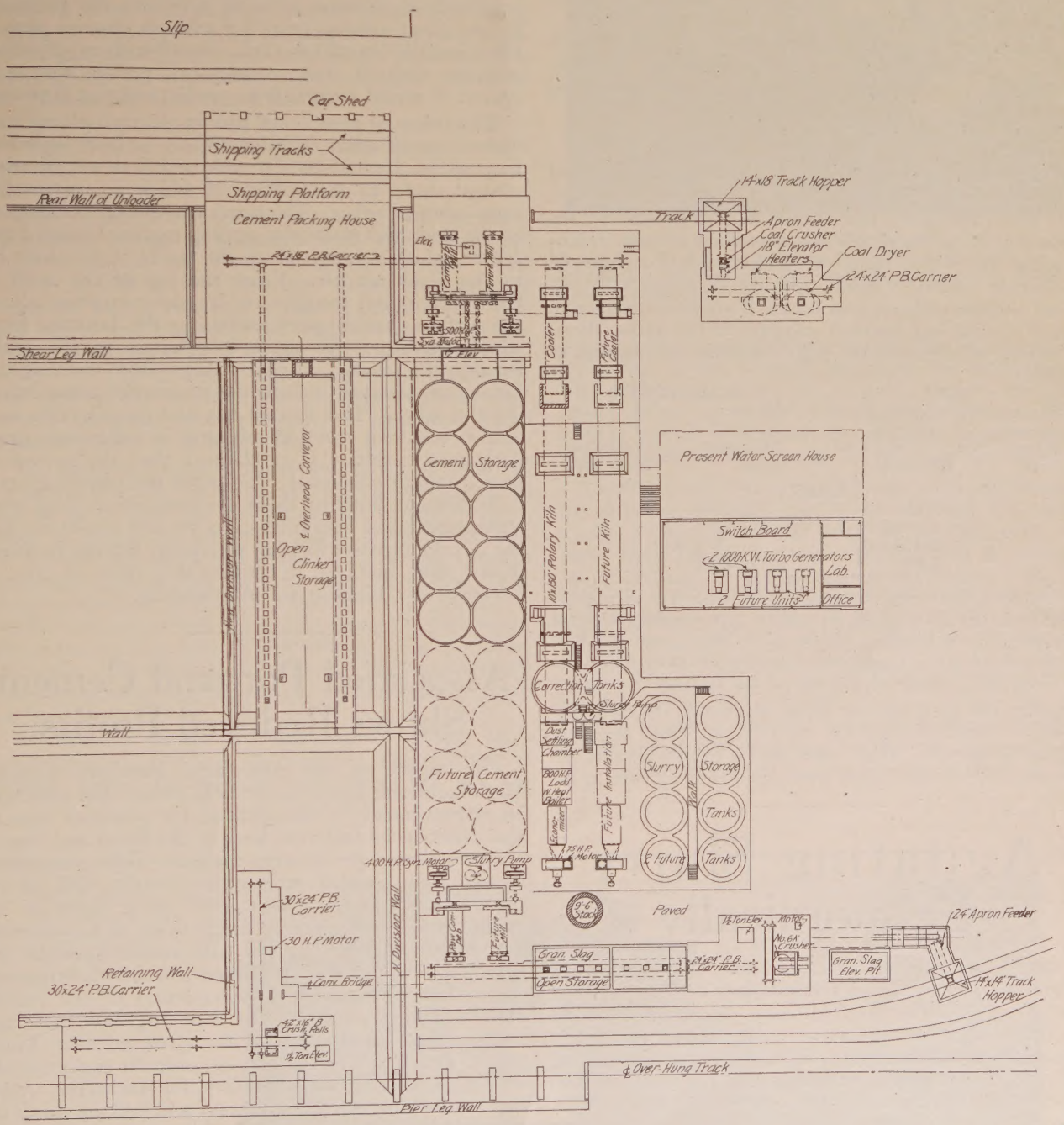


Fig. 9—General Foundation Plan of 1000-Bbl. Cement Plant of the Ford Motor Co. at the River Rouge Plant

force being divided into 3 shifts, working 8 hours each. Forty-eight hours work constitutes a week, and if a man works over time one day, he takes that same amount of time off on some other day. The operating force is made up of men taken from the general employes of the Ford organization, few being hired especially for the cement plant as experienced cement plant employes. The time that each man puts in in the plant is 8 hours, day workers only have one half hour for lunch.

At lunch time, lunch wagons are hauled through the plant by tractors, and the employes may, if they wish, purchase combination box lunches at 20 cents each. In addition, they may purchase soup and coffee or milk from the lunch wagon, giving them a balanced meal for 30 cents.

It is aimed to have two men equally trained for each job, so that any man employed in the plant will have a co-worker, experienced in the work to be done and ready at any time to take his place.

The Brand

The brand name of the Ford product is "Ford Cement." Mr. Ford's esteem for the "flivver" and the world-renowned Ford radiator is evidenced by his selection of a brand label for his cement bags reproducing the Ford radiator, and the well-recognized signature "Ford", which appears so universally on Ford service stations and on all Ford advertisements. Each cement bag bears in addition to the name "Ford Cement", analyses of the slag, limestone and cement as follows:

SLAG		LIMESTONE	
Silica	30-40%	Silica	1.75 max.
Alumina	10-17%	Alumina	1.75 max.
Magnesia	5% max.	Magnesia	1.00 max.
Lime	Balance	Lime	96.00 min.

CEMENT	
Silica	22-25%
Alumina	9-12%
Magnesia	5-% max.
Lime	62-66%

As with Ford automobiles, you can have the label on the sacks printed in any color you choose, as long as you choose black. There is no fancy emblem nor brilliant color to attract attention to the cement sacks.

How Mr. Ford will dispose of his output of cement can only be conjectured, but it is not unreasonable to believe that, with the Ford company's present building program, capacity output, and more, will be required to fill the cement requirements of the organization.

Agitating Slurry Economically

One of the difficult tasks in some of the chemical engineering industries is the handling and storing of a slurry. Perhaps as good an example as any is found in the average wet process cement plant. Here it is necessary to store a slurry of finely ground limestone and shale containing roughly 33% of water. The slurry must be stored until it has been analyzed in the laboratory and the ratio of limestone to shale corrected. In this interim it must not be allowed to settle, which of course means that it must be stirred in some way.

The orthodox methods of stirring slurry are two. The most widely used method consists of a large paddle with blades set at an angle of 45°. It does not require a very vivid imagination to realize that the amount of power necessary in this operation is out of proportion to the results achieved. As a matter of fact a tank of slurry often requires 10 to 15 h.p. depending on its size, to accomplish agitation by this method.

A second and quite common method of stirring is by means of air. In a 30-ft. tank, air is forced upward through the slurry from a dozen to twenty pipes extending to within a foot of the bottom. Naturally the air is not applied continuously, but is turned on for perhaps 5 minutes every hour. This is less expensive than the first method as far as power is concerned but it requires considerable attention from the operating men, which is, of course, a drawback

Two newer methods have recently come to our attention which show that in some quarters at least constructive thought is being given to the problem. In one plant a screw propeller with an upward push is being installed in a 30-ft. tank. Small-scale experiments indicate that it has economical possibilities and *apriori* it would seem safe to predict a saving in power.

The other system is in use in several plants and makes use of what is substantially a Dorr agitator. In principle it consists of a tank with a slowly rotating central shaft, at the bottom of which are two radial arms carrying rakes. The latter travel near the bottom of the tank and move the settling material toward the center, where it is forced up the inside of the shaft by means of an air lift. From the top of the shaft it flows into radial troughs or launders rotating above the surface, having perforations in the bottom, from which the slurry is again distributed to the tank. Finally the charge is partly kept from settling by forcing air through it from the submerged arms carrying the rakes. This system has had considerable success in handling reaction mixtures in other industries with good results. It is claimed that the saving in power amounts to nearly 75% over the paddle stirrer.

At present both of these systems are so new that replacement and operating costs are not available, but the developments will bear watching, for the problem is one that involves a considerable item of cost.—*Chemical and Metallurgical Engineering.*

Associated Portland Cement Shows Reduced Profits

The report of the Associated Portland Cement Manufacturers, Limited, for 1923 states that although an improvement in the demand for portland cement was experienced last year both in the home and export markets, lower prices were realized. The company's export trade, which represented nearly 40% of its aggregate deliveries, was carried on at little or no profit, owing to the severe competition of Continental manufacturers who enjoyed a favorable position by reason of the depreciation of their respective currencies. These factors resulted in a reduction of the profits earned, which at £582,328, including revenue from investments, compared with £675,396 in 1922. These results are obtained after setting aside the sum required to meet the estimated liability for taxation. After making provision for the interest and sinking funds on the debenture stock issues, and for the dividend for the year on the preference shares, and after placing £125,000 to general depreciation reserve together with $15,000 to barge depreciation, there remains no balance available for the payment of a dividend on the ordinary shares without encroaching on the balance brought forward from the previous year, which the directors cannot recommend, in view of the general conditions of trading.

Alpha Portland Cement Co. Completes Two Stockhouses

By A. J. Lindquist

Two cement stockhouses and packing plants for the Alpha Portland Cement Co. have recently been completed by the Macdonald Engineering Co. One of these plants is located at La Salle, Ill., and has a storage capacity of approximately 125,000 bbls. of cement. The building consists of six 33 ft. inside diameter bins, 80 ft. high. The packhouse is a building 30 ft. 8 in. by 68 ft. 4 in., and is five stories high, which accommodates four 3-tube Bates packers. The buildings are on a concrete pile foundation put in by the MacArthur Concrete Pile Co.

The plant at Ironton, Ohio, has a storage capacity of approximately 170,000 bbls., consisting of eight bins 33 ft. inside diameter by 80 ft. high. The packhouses are identical at both places.

These concrete structures were built with the movable form, which is standard with the Macdonald Engineering Co. on this type of construction. This system is well known, and the results produced are excellent, as the concrete is poured continuously day and night, and the walls can truly be termed monolithic. An average of 8 ft. per day in height is considered very good, but if ideal weather conditions are had during the construction of these walls, better records are made, in which case even as high as 16 ft. is accomplished in a single day.

The finished cement at these storage plants is carried by means of screw conveyors and bucket elevators from the finish mill to the stockhouse for storing. Then, when shipping, the cement is drawn from the bottom of the silos into screw conveyors. This is done through numerous spouts and feeders under each bin. The screw conveyors under the bins carry the cement to bucket elevators which elevate the cement to the screens above the packing bins. These screens are of the screw conveyor type, which have perforated housings to catch stray material or heavy lumps of cement from going to packers.

Above each packer is a packing bin which holds approximately 350 bbls. of cement. This amount of storage above the packer could keep the machine going at short periods even though part of the equipment had to be stopped for repair or replacement. The packing machines are in pairs, that is, two machines delivering to each side of the packhouse. This is done by belt conveyors, and the usual apron is provided to load to hand trucks for trucking into the cars.

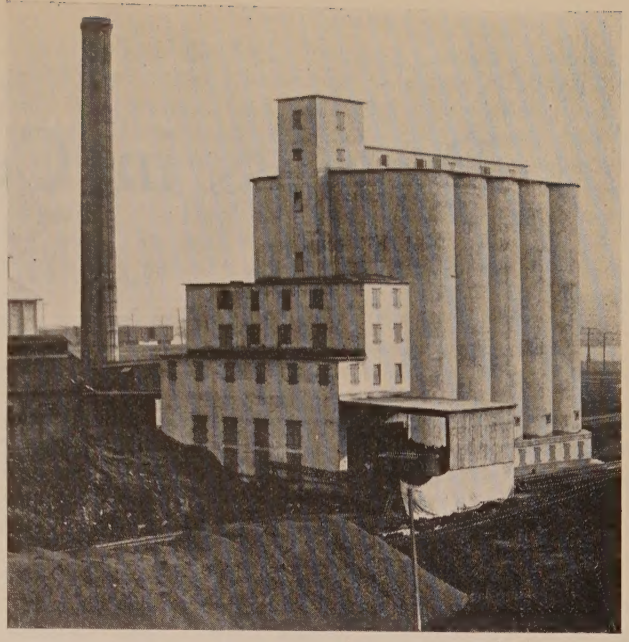


Fig. 1—Cement Stockhouse and Packing Plant Built at La-Salle, Ill., Plant of the Alpha Portland Cement Co., by the Macdonald Engineering Co. Storage Capacity Is Approximately 125,000 Bbls.

There are two tracks on each side of the packhouses for shipping, a track shed being provided over these tracks at the packhouse only, to prevent rain and snow from interfering with the shipping operations. As can be seen in the accompanying illustrations, the windows are not of the usual type of steel sash with glass, but are steel plates on hinges. This may seem a little unusual but it works out nicely, as they can be opened for light and ventilation and, at the same time, are not subject to breakage. It is a fact in some plants that when the glass in the windows becomes covered with cement and the light is dim, the glass is broken out to admit more light, but then, in case of a storm, some temporary protection must be made.

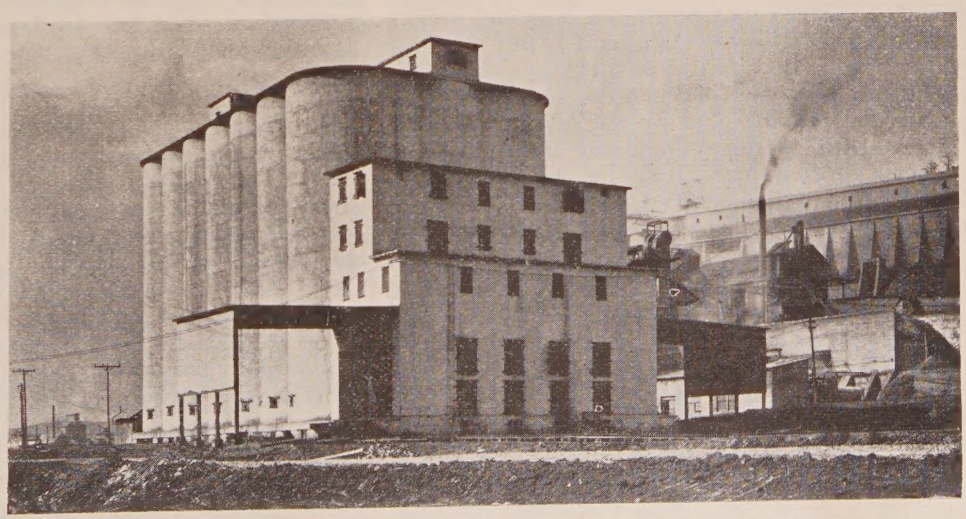


Fig. 2—Ironton, Ohio, Silo Storage and Packing Plant of the Alpha Portland Cement Co.

Progress in Cement Industry

By G. S. Brown
President, Alpha Portland Cement Co.

Reprinted from *Alpha Aids*.

The portland cement industry appears to attract, as a magnet does iron, the caustic comment of many public officials, publicists, contractors and engineers on its general method of doing business. Particularly do they cry out against alleged price agreement and profiteering.

Such comment doubtless has its origin in the fact that, generally speaking, cement of whatever brand or by whatever company manufactured is, approximately the same price at the same time in any community, which price is the lowest one that any manufacturer has named at such a point. In this respect the cement industry is no different from any other which manufactures a single commodity, under uniform specifications. These minimum specifications, in this industry, are so high as to make any cement which will pass them, entirely satisfactory to the user of that product.

A cement manufacturer has only one thing that it may offer to its customers that is different from that which is offered by its competitors—namely, service. The loss of price competition in the industry has resulted in giving great emphasis to service competition. By reason of this fact, the industry has made rapid progress in many ways which if rightly understood would change the comment of its critics from caustic to congratulatory. The purpose of this article is to call attention to some of the outstanding accomplishments of the industry.

Distribution Cost Decreased

One of the foremost questions or problems before our officials and the public, generally, today is the cost of distribution. For example, it is said that the farmer in Illinois or Missouri gets 12 or 14¢ a pound for his poultry, while the man who purchases one of these chickens for his Sunday dinner in New York City must pay 50¢ a pound. It being popular to blame all the ills of our distribution system on the railroads, the farmer is assured that he should have his freight rates reduced and he would then get a better price for his poultry when, as a matter of fact, something like one cent of the difference between the 14¢ received by the farmer and the 50¢ paid by the person who eats the chicken, goes to the railroad for transporting it from Illinois to New York. The remainder goes to the various agencies handling the poultry.

The writer has been in the cement business since 1898 in various positions with the Alpha Portland Cement Co. At that time, in the industry, there were three to five profits between the manufacturer of the cement and the ultimate user. There were General Sales Agents, Division Sales Agents, Wholesalers, Jobbers, Brokers, and Retailers. The product of the Alpha company, at that time, passed through at least four, and in some cases, five hands before it reached the user. Each transaction, of course, added a profit for itself. Today it is a rare thing for portland cement to pass through more than one hand before it reaches the ultimate consumer. Nor has the Alpha Portland Cement Co. during these years, received any benefit from this reduction in the number of transactions made between the mill of the manufacturer and the ultimate user of the cement. On the contrary, the consumer has, in every case, the benefit of the reduction in the cost of distribution. Few, if any, of our industries can make anything like as satisfactory a showing in distribution cost.

Quality Very Much Improved

In 1898 there were no uniform specifications and the user of portland cement was largely at the mercy of the manufacturer. Some few engineers attempted to have a standard, but generally, portland cement was purchased on the reputation of the manufacturer, and it was not impossible then for a manufacturer, whose product experience had demonstrated to be uniform and reliable, to get a considerable premium for it as compared with less well-known brands. At that time a cement, 90% of which would pass a 100-mesh sieve and 72% of which would pass a 200-mesh sieve, was considered an unusually good one. Gradually, during the years that have passed, standards have been raised, partly by competition between manufacturers and partly by the insistence of engineers, until now we have the Standard Specifications of the American Society for Testing Materials, which have been approved by the United States Government, and which are required by practically all engineers and architects. Through this specification all users of cement are protected as to quality, and no manufacturer whose product fails to meet these requirements can successfully market it. No longer is it possible for a manufacturer of portland cement to get any premium for this product. In fact, in May, 1922, at the trial of some of the cement manufacturers in New York City, witness after witness put on the stand by the Government testified that he would not give as much as one cent per barrel more for one brand of cement than another. Later, I shall attempt to show how this fact has operated, first to keep prices at a low level, and second to force the so-called uniformity of prices.

Relatively a Very Large Reduction in Price

In 1898, the Alpha Portland Cement Co. hired its labor for 10¢ an hour and bought its coal for $1.57 a ton. It paid 7½¢ to 8¢ each for its bags. It received for its cement a maximum of $1.85 per barrel. In that same territory today, the Alpha Portland Cement Co. is paying 45¢ an hour for its labor and, during the year 1923, an average of $5.00 a ton for the coal used, and 17½¢ to 20¢ each for its bags, while the maximum price received for its product is $2.25 per bbl. Labor and coal are major items of expense in the manufacture of cement. In both prices, bags represent 40¢, there being four bags to a barrel. As is well known, the value of other elements entering into the cost of our product has increased in nearly the same proportion since 1898, and only the fact that large sums of money have been expended in the cement industry for labor-

saving machinery and that it has through painstaking research developed other economies, enables cement to be sold today for relatively less than half what it sold for in 1898.

In 1898, portland cement was manufactured in the United States in quantity in only one locality; that, the so-called Lehigh Valley in Eastern Pennsylvania, and Western New Jersey. Users of this material in the far west were obliged to pay not only the going price at the mill, but the very heavy freight charges necessary to transport it from the mills in Western New Jersey or Eastern Pennsylvania to wherever it was to be used. At that time the Alpha Portland Cement Co. shipped many thousands of barrels of cement from its mill in Western New Jersey to St. Louis, Chicago, Minneapolis, and St. Paul, and even as late as 1906 and 1907 to as far distant points as Medicine Hat in Alberta. Although it was supposed that portland cement could be manufactured only from the rock found in the district referred to above, research by chemists and others developed the fact that there were few states in the Union where portland cement could not be made and, in the ten or fifteen years following 1900, portland cement manufacturing plants were built in nearly every part of the United States. This wide distribution of manufacturing plants has tremendously reduced the price to the user in the central west and far west.

Development of New Uses

Prior to 1907 and 1908 the industry had been profitable, but with the advent of numerous new plants in various parts of the country a capacity for production ensued very greatly in excess of the demand, and for eight or ten years thereafter the price of cement was so low that only those concerns with unusual natural facilities or unusually able management could make money. Scores of concerns in the portland cement industry went into receivership and bankruptcy.

Along about 1910 to 1915 some of the ablest men in the industry began to realize that in portland cement they were offering to the public the most useful building material that could be found, and felt that if its properties were known to the public generally, a demand could be brought about which would use the surplus productive capacity in the country. The Association of American Portland Cement Manufacturers had been in existence since 1902, largely as a social organization, but in later years doing some educational and promotional work with limited resources. In 1915 this organization was reorganized as the Portland Cement Association; sufficient funds were provided and a campaign was begun to bring to the knowledge of the public the value of portland cement as a building material, and the best ways of using it. This campaign has continued to the present time. One of the results has been to bring to the knowledge of the public officials and to the public generally, the fact that cement will make, by long odds, the cheapest and best highways that can be built, and since the war there has been a continually increasing demand for the product which culminated in 1923 with shipments exceeding 135,000,000 barrels, as against something like 3,000,000 barrels in 1898.

The Association also carries on, at considerable expense, a research laboratory where the best methods of using cement are carefully studied and the results broadcasted to users throughout the country. In recent years economies in construction, unexpectedly large, have resulted from this research work. The Association also carries on extensive accident-prevention work and is engaged in research looking to the elimination of waste in the manufacture of cement.

Profiteering

The mills of the Alpha Portland Cement Co. have a productive capacity somewhat in excess of 10,000,000 bbls. per annum. Any engineer experienced in the design and construction of a cement mill will testify that an investment of $2.50 per bbl. of annual capacity, including fixed and working capital, would be conservative. On that basis, the Alpha Portland Cement Co. would be entitled to a stock issue of $25,000,000, instead of which it has issued $17,800,000; and, in only two years since 1910 have the stockholders received 6% on their holdings—once in 1920 and again in 1923. The financial pages of the press, almost daily, carry news items showing earnings by industrial concerns of $10 to $15 and even as high as $25 to $30 per share, per annum, without comment, unless it be of a congratulatory nature. Why this industry, in which only the exceptional concern has ever earned in excess of $10 per share per annum on its investment, should be singled out for abuse, is hard to understand.

How Prices Are Made

There has not been, since the early days of the industry, any material difference in the price of cement at the same time and place, as there has not been in the price of any commodity of the same quality, except in periods of great demand when all manufacturers could sell their product, no matter what price was charged, and the price varied as the individual manufacturer was satisfied with his return; or when the demand was small and the financial necessities of the individual manufacturer forced a price below cost and other individual mills would refuse to meet it.

Originally all prices were based on Lehigh Valley prices and while, doubtless, in the early days the price received by individual mills varied, the price to the consumer was the same. Indeed, it is this fact that ultimately forced the industry to go direct to the retailer. Mills passing their product through three to five hands were in no position to compete with those manufacturers who sold with one or, at most, two handlings. When new mills were located in other parts of the country they took advantage of their lesser freight rate to destination and got correspondingly higher mill net. Ultimately some of the large producers were unable to sell as much cement as they wished on this basis, and Universal Portland Cement Co., which had developed large production at Buffington, Ind., and Universal, Pa., began to quote at their own mills, plus freight, instead of Lehigh Valley plus freight. Lehigh Portland Cement Co. and Atlas Portland Cement Co., which concerns had developed large production at various other points throughout the country, also began to sell on their own base at points of their production, and we have today the consuming public getting the full freight advantage of nearby production on probably 80% of the cement manufactured in the country—although we have steel quoted on Pittsburgh prices, copper on New York prices, lead on St. Louis prices, etc. Naturally, not having a cement exchange, prices do not respond to variations of demand or to speculative trading as do wheat and cotton, nor is it possible to have secret rebates, preferred customers, or other methods of shading our price, such as are in vogue in many lines of business where the product is not universally distributed. Some of these methods of price-making are undoubtedly used by smaller companies, but large concerns with a distribution of their product in every town of any size throughout a given state, were forced to go to a one-price basis for all customers. This seems to be a method of doing business which is highly commended when used by a department store, but highly criticized when used by a

cement company.

Normally our price is determied by three elements—cost, demand, and competition, with the latter element the determining one so long as we get a price above cost. My observations over a period of twenty-five years have led me to the conclusion that the general going price of cement, except in times of great demand, or under depressed conditions, becomes stable at a figure which will give well managed and financed concerns some margin over cost, perhaps in the majority of these cases sufficient to return 6% on the investment. This is not usually paid, because in order to keep place in this class, there are always improvements to be made. Another group of mills, and this is the largest of the three, will break even or a little better, while the third group will lose money. Price changes upward are difficult to make, unless in periods of heavy demand. When forced by increases in cost of coal and labor they invariably mean a partial cessation of orders for current business to the concern making the increase. Those mills which have favorable coal contracts and favorable labor conditions will not follow until such time as they have increased their future sales to what they regard as a satisfactory total. However, when one mill has been forced to raise, there are many others in the same economic position, and such usually quickly follow. Those mills which remain on the lower base are usually quickly filled up with orders on the lower price and they too then go up, or as has been done in one or two instances in recent years, allot the available cement ratably among their customers. The period in which prices are variable when a raise is taking place varies from three or four days to three or four weeks.

Except when the margin of profit is large, the period of variation in prices, when a reduction is in process, is much longer. Usually some small mill is short of orders and needs money. It proceeds to make individual sales at less than its going price. The cut is probably not large and is carefully planned to do as little damage to the general business of the company as possible. In trade parlance they "get away with it" and enlarge the range of price variation until some other weakly financed concern is hurt, when it, too, will begin to make reductions. The one-price concerns will see their business reduced rather than cut to all customers, hoping that conditions will change. If they do not, the time comes when they too must reduce and their reduction goes to all alike. Action of this kind by a large producer is quickly followed by all companies, unless the new price is below cost. The industry is then on a new price basis. The period of transition in such a price change may be as long as four or five months or may take place in as many days, depending upon the time of the year and the prospective demand.

In conclusion I want to quote from the recent opinion of Judge Knox of New York, granting the Government's request for the dissolution of the Cement Manufacturers Protective Association. He said: "There is, I take it, no need to find that the prices at which defendants sold cement during the period over which the Association has functioned were excessive. Indeed, as compared with the rise in the prices of other basic commodities, it is possible to say that the quotations of cement advanced less than others."

The industry is furnishing an unusual building material of the widest range in usefulness, at a price lower than is known for any other material requiring complex manufacturing processes. Those engaged in it have, in addition, a strong ambition, as yet unrealized, to give their stockholders a reasonable return regularly on their investment.

Canadian Lime Companies Start Early

Those Canadian lime manufacturing companies that operate only during the spring, summer and fall, with the usual idle period in the winter, have experienced the earliest opening of the kilns this year in more than 15 years. Usually the operations are not started for the season until about the middle of April, but this year, some of the companies resumed the manufacture of lime about the middle of March. In view of the mild weather and lack of snow that characterized the winter of 1923-1924, little difficulty was experienced in preparing the various plants for the start in March. This will mean one of the longest manufacturing seasons on record.

For the first time in many years the operations of Fraser Companies Limited, an eastern Canada lime manufacturing concern, has exhibited a substantial profit. However, the lime manufacturing operations have at all times shown a profit, but the profit has been swallowed up in a general loss of the concern in lumbering and pulp manufacturing.

The New Brunswick Lime Mfg. Co., operated its plants all through the winter, being hampered but little by the storms and cold weather. New rock was cut into and prepared for the lime manufacturing process in the spring. Although one of the most recently organized lime manufacturing companies in eastern Canada, the New Brunswick Lime Mfg. Co., has been producing large quantities of lime during the past three years.

Combustion in Cement Kilns

A method of getting the maximum temperature in a cement kiln where it is most desired is described by Otto Dormann, of Stettin, Germany, in Patent 1,484,-254, issued Feb. 19, 1924.

Recent investigations have established the fact that the sintering reaction in cement manufacture is exothermic, so that maximum temperatures are not required in the sintering zone of the kiln but rather in the calcining zone just preceding, where the reaction is endothermic.

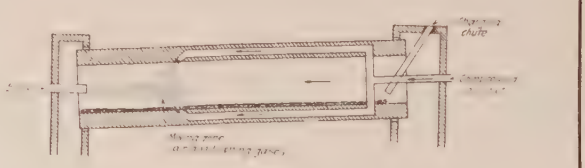


Fig. 1—Cement Kiln with Secondary Air Supply

Mr. Dormann proposes to obtain the desired result by introducing secondary air into the calcining zone at high pressure and at an angle in a direction opposed to the flame. This causes the formation of eddies, which give an intimate mixture of fuel and air. At the same time the gases are dammed up in such a way that they will not pass across the material at a higher speed than is consistent with reasonable heat transfer to the cement.

The secondary air may pass longitudinally through the kiln walls before reaching the discharge orifice and thus become preheated. Additional fuel may also be mixed with the charge. This will be burned by the secondary air.—*Chemical and Metallurgical Engineering.*

Portland Cement Output In March, 1924

March production of portland cement in the United States appears to hold the record for the month in any year, and the stocks are the highest ever recorded. Shipments were exceeded in March, 1923, but are increasing at a rate nearly parallel with that of 1923. Statistics shown in tables, issued by the Department of Interior and prepared under the direction of Ernest F. Burchard of the Geological Survey, are based mainly on reports of producers of portland cement, but in part on estimates, the estimates for March, 1924, being made necessary by the lack of returns from two plants.

A comparison of production, shipments and stock at the end of March for the years 1923 and 1924 are shown in the following table:

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS IN MARCH, 1923, AND 1924, AND STOCKS IN FEBRUARY, 1924, IN BARRELS

Production March		Shipments March		Stocks at End of March		Stocks at End of February 1924(a)
1923	1924	1923	1924	1923(a)	1924	
9,880,000	10,370,000	10,326,000	8,995,000	13,045,000	18,190,000	16,815,000

(a)Revised.

Stocks of clinker, or unground cement, at the mills at the end of March, 1924, amounted to about 8,261,000 bbls. compared with 6,905,000 bbls. (revised) at the beginning of the month.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1923 AND 1924, IN BARRELS

Month	Production		Shipments		Stocks at End of Month	
	1923	1924	1923	1924	1923(a)	1924
January	(a)7,990,000	8,788,000	(a)5,628,000	5,210,000	11,477,000	(a)14,155,000
February	(a)8,210,000	8,588,000	(a)6,090,000	5,933,000	13,596,000	(a)16,815,000
March	9,880,000	10,370,000	10,326,000	8,995,000	13,045,000	18,190,000
1st quar.	26,080,000	27,746,000	22,044,000	20,138,000		
April	11,359,000		12,954,000		11,463,000	
May	12,910,000		14,257,000		10,144,000	
June	12,382,000		13,307,000		9,168,000	
2nd quar	36,651,000		40,518,000			
July	12,620,000		13,712,000		8,081,000	
August	12,967,000		14,971,000		6,080,000	
September	13,109,000		13,698,000		5,533,000	
3rd quar.	38,696,000		42,381,000			
October	13,350,000		14,285,000		4,612,000	
November	12,603,000		10,251,000		6,991,000	
December	9,997,000		6,408,000		10,575,000	
4th quar.	35,950,000		30,944,000			
	137,377,000		135,887,000			

(a)Revised.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in February, 1924, amounted to 162,930 bbls., valued at $219,588. The total imports in 1923 amounted to 1,678,636 bbls., valued at $2,964,098. The imports in February were from Belgium, 79,824 bbls.; Denmark, 65,216 bbls.; Norway, 17,223 bbls.; other countries, 667 bbls. The imports were received in the following districts: Los Angeles, 66,467 bbls.; Porto Rico, 65,216 bbls.; Washington, 11,974 bbls.; New York, 11,212 bbls.; other districts, 8061 bbls.

The exports of hydraulic cement in February, 1924, were 62,606 bbls., valued at $194,110, of which was sent to Cuba, 27,164 bbls.; to the other West Indies, 4267 bbls.; South America, 16,710 bbls.; Mexico, 8058 bbls.; Central America, 2839 bbls.; Canada, 885 bbls.; and to other countries, 2683 bbls.

The statistics of imports and exports of hydraulic cement in March, 1924, are not available.

IMPORTS AND EXPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1923 AND 1924, IN BARRELS (a)

Month	Imports		Exports	
	1923	1924	1923	1924
January	71,686	153,732	74,169	88,588
February	20,529	162,930	88,531	62,606
March	66,521	(b)	98,861	(b)
April	76,899		85,662	
May	88,480		103,634	
June	111,559		77,203	
July	286,106		82,774	
August	324,008		73,201	
September	215,785		77,121	
October	172,051		74,302	
November	140,590		85,743	
December	104,422		80,487	
	1,678,636		1,001,688	

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce.
(b) Imports and exports in March, 1924, not available.

ESTIMATES OF PRODUCTION, SHIPMENTS, VALUE, AND STOCKS OF FINISHED PORTLAND CEMENT IN 1923, BY STATES

(Subject to revision)

State	Active Plants	Production	Shipments		Stocks Dec. 31
		Barrels	Barrels	Value	Barrels
Alabama	5	3,471,000	3,395,000	$6,200,000	137,000
California	9	11,490,000	11,394,000	27,400,000	350,000
Illinois	4	7,149,000	7,032,000	12,500,000	642,000
Iowa	5	5,732,000	5,572,000	10,600,000	952,000
Kansas	7	6,057,000	5,859,000	11,000,000	769,000
Michigan	14	7,507,000	7,448,000	14,300,000	710,000
Missouri	5	7,276,000	7,137,000	13,600,000	724,000
New York	9	6,966,000	6,853,000	12,900,000	653,000
Ohio	6	4,189,000	4,003,000	7,600,000	347,000
Pennsylvania	22	37,768,000	38,274,000	70,400,000	2,077,000
Texas	5	4,180,000	4,075,000	8,200,000	278,000
Washington	4	2,091,000	2,111,000	4,900,000	241,000
Other States (a)	31	33,501,000	32,734,000	62,400,000	2,695,000
	126	137,377,000	135,887,000	262,000,000	10,575,000

(a) Including Colorado, Georgia, Indiana, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oklahoma, Oregon, Tennessee, Utah, Virginia and West Virginia.

MASONRY, NATURAL AND PUZZUOLAN CEMENT SHIPPED, 1922 AND 1923

State	1922			1923(a)		
	Producing Plants	Barrels	Value	Producing Plants	Barrels	Value
Alabama (b)	1	497,081	$798,434	1	684,563	$1,137,585
Illinois	1			1		
Indiana	1			1		
Kansas	1			1		
Kentucky (c)				1		
Minnesota	2	392,347	495,164	2	587,111	809,707
New York	1			1		
Ohio	1			1		
Pennsylvania	1			1		
	9	889,428	1,293,598	10	1,271,674	1,947,292

(a) Subject to revision. (b) Puzzuolan only. (c) Not included in 1922.

The Titan Cement Co. at Ackerman, Mineral County, W. Va., has applied to the State auditor to sell stock on a capitalization of $500,000. The proceeds will be used to erect a 1200-bbl. plant on the Potomoc River between Keyser and Cumberland

All the raw materials for making first class cement are found right in the property where the plant will be erected, and the geologists' report shows that there is enough material in the young mountain of shale and limestone to last for three generations, placing the rate of manufacture at 1200 bbls. a day.

The company has recently purchased the property which consists of 555 acres, with a 10,000-ft. front on the river, which costs $337,000. A rock crushing plant, already working in the quarries, was transferred with the property, and will form part of the new plant to be erected at a cost of $375,000.

There is only one other cement manufacturing plant in the state. The Alpha Portland Cement Co. began work at Manheim, Preston County, about 20 years ago, and today employs more than 200 workmen.

Newly Completed Plant of the Manitowoc Portland Cement Co.

Manitowoc Portland Cement Plant Ready for Operation

The Manitowoc Portland Cement Co.'s plant, as shown in the accompanying illustration and located on the Manitowoc river, Manitowoc, Wis., is receiving its finishing touches. The river has been dredged to a depth of 21 ft. to admit the largest type freighters to the company's dock.

The plant is a wet process plant, using limestone from Michigan quarries and local clay as raw material. The limestone and coal will be received by boat and unloaded with a Mead-Morrison bridge crane having a capacity of 300 tons per hour. This bridge travels parallel to the plant on runways 900 ft. long, and covers a span of 234 ft. It will pile material to a height of 51 ft., and also reclaims the material from storage, delivering it into bins which feed the mills.

The plant contains three kilns 10 ft. in diameter and 160 ft. long, made by the Manitowoc Engineering Works. These kilns give the plant a capacity of 3500 bbls. per day. A waste heat installation will furnish power to operate the plant.

Cement shipments can be made either by rail or by water. The plant is within the city switching limits, which is served by the Soo Line, Chicago and North Western, Pere Marquette and Ann Arbor railroads. Manitowoc being one of the gateways through which an enormous amount of east- and west-bound traffic flows via car ferry across Lake Michigan, an ample supply of empty cars is assured, since normally, 40% of the cars moving westward are empty. This, together with direct rail service to Wisconsin and Upper Peninsula points in Michigan, will enable the company to serve its territory to the best possible advantage.

The plant is practically completed, and it is planned to begin operation by May 15. Since the first concrete in construction of the plant was poured on September 18, 1923, the company undoubtedly holds the record for rapid construction of a plant of this capacity. The brand name of the cement is Badger State.

The officers to whose efforts the success of the Manitowoc company is attributed are: president, Charles C. West; vice president and general manager, J. B. John; secretary and treasurer, L. E. Gear: assistant general manager, H. Vanderwerp; assistant secretary, P. G. Dawson.

Cement Rates to New England Suspended

Revision of the freight rates on cement from the Hudson and Lehigh districts to New England territory served by the Maine Central, Bangor & Aroostook, and the Grand Trunk has been disapproved by the Interstate Commerce Commission. The rates had been filed to become effective in January and February, but were suspended by the Commission pending investigation. The alleged purpose of the proposed adjustment was to give the cement mills in the Lehigh and Hudson districts joint rates to New England territory. A number of reductions and some increases would have resulted, while a few of the rates would have remained unchanged.

The proposed adjustment would have established a uniform spread of 50¢ per 100 lb. in the rates from the Hudson district under those from the Lehigh district to points beyond Portland. This is substantially the present difference in the rates to Portland, the gateway for this territory. At present the rates from Glens Falls and Howe's Cave are higher than the rates from Hudson and Alsen. The proposed rates would have placed the entire Hudson district on the same basis to all destination territory.

The Atlas Portland Cement Co. and the Knickerbocker Portland Cement Co. protested against the proposal, and it was finally dismissed by the Commission on the ground that the differences between the proposed rates and the rates for corresponding distances under the Troy and Beacon scale and the scale prescribed for application in western trunk line territory are too pronounced.

J. B. King Co. Joins United States Gypsum

The United States Gypsum Co. has effected a combination with the J. B. King Co., of Staten Island and Nova Scotia. The King Co. was one of the first in this country to manufacture gypsum products, the business having been founded by Jerome B. King in 1834, when he built a 4-ft. calcining kettle at his home.

The J. B. King plant receives its gypsum from quarries in Nova Scotia, a deposit selected after tests of the quality and economy of every known bed in the gypsum area of the Maritime Provinces. For conveying the gypsum rock to the Staten Island mill efficiently and economically, special type boats have been designed, and these have been augmented as the demands of the mill increased, until the fleet at present numbers seventeen. The production includes molding and casting plaster, white finishes, pottery plaster, dental plaster, etc.

It is announced by the U. S. Gypsum Co. that the King organization remains active in the association. Dealers in the metropolitan district with water frontage are receiving quick deliveries by means of five steam lighters. Extensive alterations and enlargements of the Staten Island plant to increase its capacity and to produce Sheetrock, plaster board, Pyrobar partition tile, etc., are being made or are under consideration.

Cement, Lime, and Gypsum in Canada During 1923

Abstracted from an article by the Dominion Bureau of Statistics in *Contract Record and Engineering Review.*

The activities in the building and construction industries in Canada which were so outstanding in 1922 were fairly well maintained during 1923. Although there was a slight decline in the total value of all structural materials produced during 1923 as compared with the previous year, the quantities were slightly higher. The total valuation according to reports at hand was $36,993,088 as compared with $39,534,741 in 1922.

Cement

Ten plants were reported as producing in the cement industry during 1923; four of these were in Ontario, and one in Quebec; two in Manitoba; two in Alberta; and one in British Columbia.

The total mill output of portland cement was 7,688,196 with an estimated valuation of $15,417,587. The production (sales) amounted to 7,543,590 bbls. worth $15,064,661, while the records for the previous year showed 6,943,972 bbls. at $15,438,481. Thus there was an increase in sales of 599,618 bbls. with a decrease in value of $373,820. The average selling price over the whole Dominion for 1923 computed from the total quantity sold and sales value recorded was $2 per bbl., as compared with $2.22 per bbl. in 1922.

Summary Statistics of the Cement Industry in Canada, 1922 and 1923

	1922		1923	
	Barrels	Value	Barrels	Value
Output	6,447,696	$14,324,715	7,688,196	$15,417,587
Sold or used	6,943,972	15,438,481	7,543,590	15,064,661
Stocks, Dec. 31, 1921	1,603,215	.....	1,106,939	.....
Stocks, Dec. 31, 1922	1,106,939	.....	1,251,545	.....
Imports—				
Portland	30,914	96,310	17,697	75,294
Manufactures	.....	13,273	.....	86,974
Exports	425,137	699,738	493,751	824,811
Consumption	6,549,749	.....	7,067,536	.....

Clay and Clay Products

The clay and clay products group includes the production of (a) brick—common, pressed, molded and ornamental and hollow-building brick or block, (b) drain tile and sewer pipe, (c) pottery, (d) architectural cotta. (e) kaolin or china clay, (f) refractories—fireclay, firebrick, fireclay block and shapes. The production of these commodities of Canada during 1923 was valued at $10,258,712, a decrease of 10% from the production which was valued at $11, 438,456. This coincides with the Bureau's report on building permits in 56 cities which showed a decline of 10.4 % in value when compared with the previous year. The decrease was not confined to any particular set of products but was distributed throughout the list.

Lime

The total value of lime produced in Canada in 1923 was $3,153,843 a decrease of 0.4% from the 1922 production of $3,165,005. The total production comprised 7,761,173 bushels of quicklime valued at $2,526,125 and 51,765 tons of hydrated lime at $627,718.

Ontario continued to be the leading producer of quicklime accounting for 3,992,060 bushels worth $1,287,947. Quebec followed with 2,119,425 bushels at $555,955. Hydrated lime amounting to 41,727 tons valued at $519,839 was produced by Ontario operators.

The average selling price for quicklime in Canada was 33¢ per bushel as compared with 34¢ in 1922; hydrated lime averaged $12.13 per ton this year against $12.15 in the previous twelve months.

Importations of lime into Canada amounted to 99,786 cwt., valued at $55,820, while the previous year's records showed 51,107 cwt., at $27,942. Exports were considerably higher, totalling 486,-512 cwt., worth $428,286, as compared with 286,596 cwt., at $270,724 in 1922.

Production of Lime in Canada in 1923

Province	Quicklime		Hydrated Lime		Total Value $
	Quantity Bushels	Value $	Quantity Tons	Value $	
New Brunswick	495,814	159,863	.....	.....	159,863
Quebec	2,119,425	555,955	5,595	57,482	613,437
Ontario	3,992,060	1,287,947	41,727	519,839	1,807,786
Manitoba	491,998	146,266	.....	.....	146,266
Alberta	96,905	37,653	33	346	37,999
British Columbia	564,971	338,441	4,410	50,051	388,492
Total	7,761,173	2,526,125	51,765	627,718	3,153,843

Gypsum

The production of gypsum in Canada in 1923 totalled 559,778 tons valued at $2,165,953 as compared with 559,265 tons at $2,160,898 in the previous year.

The output of gypsum rock was 565,120 tons of which quantity 150,481 tons or 27% was calcined during the year. Sales values received by Canadian operators averaged, by grades: lump, $1.65; crushed, $2.08; fine ground, $6.14; and calcined $11.28.

Exports during the period amounted to 401,983 tons consisting of 397,329 tons crude and 4,654 tons ground gypsum, with a total value of $671,337.

Revision of Canadian Law Asked

Despite the efforts made to revise the workman's compensation law, in the province of New Brunswick, the outlook is that only a few unimportant changes will be made in this law. The lime manufacturers have been asked that the unlimited liability clause be eliminated and one fixing the liability at $3500 be substituted. Another request was that the medical treatment be eliminated, as it was shown that many of the physicians were enriching themselves by keeping men and women on the compensation lists long after they had recovered from accidents. A third request was that the monthly pensions of widows and children be reduced. The workman's compensation law is charged with being a detriment to lime manufacturing in New Brunswick, it being contended that owing to waste and extravagance, the members of the Compensation Board consume about 40% of the moneys received from levies in expenses. This injures the employer and employe alike.

A concern is being formed to manufacture lime on the St. Croix River, which serves as the international boundary for about 40 miles. A modern plant will be installed and operations started this year.

Among the companies that have started the manufacture of lime this year in eastern Canada are: Fraser Companies; Randolph & Baker; Dalhousie Lumber & Lime Co.; Bathurst Co.; New Brunswick Lime Co.; C. H. Peters' Sons; Stetson & Cutler; Miramichi Lumber Co.; C. Miller & Co.; Snowball Co.; Douglas & Co.; Glasier & Sons; Sydney Lime Co.; West Coast Lime Co.; Pugwash Lime Co.; George Lime Co.; Murray & Gregory.

Owing to the prevailing high freight rates on the railroads out of eastern Canada, more than 70% of the shipments of lime from eastern Canadian lime manufacturing plants thus far this year have been by water, mostly by schooner. Practically all of the shipments of lime to the United States seaboard cities have been by schooner. The outlook is for no decrease in freight rates this year, which means a continued use of schooners as bottoms for lime. The chief lime-shipping ports in eastern Canada are St. John, Halifax, Digby, and Liverpool.

New England Portland Cement and Lime Co. Formed

All of the properties of the New England Portland Cement Co. and its various subsidiaries have been transferred to the New England Portland Cement & Lime Co. which organization will start immediately, first upon the construction of a modern lime plant of approximately 45,000 tons annual capacity to be followed shortly by the construction of a 2000 to 3000 bbl. cement plant.

Alfred S. Black is president of the new organization, and Walter E. Bowe, treasurer. The plants will be located at Thomaston and Rockland, Maine.

Men and Mills

Notes from the Field

The annual meeting of the Bureau of Accident Prevention and Insurance of the Portland Cement Association held in Allentown, April 9, was attended by over 150 superintendents of cement mills, safety engineers, and members of safety committees of plants.

The net income of the International Cement Corp. last year was nearly $1,000,000 greater than in 1922, according to the annual report issued recently. A new issue of $2,000,000 International Cement Corporation 7% cumulative preferred stock is being offered by Hayden, Stone & Co.

The No. 2 stockhouse of the Newaygo Portland Cement Co. was seriously damaged by fire last February. The building was completely filled with cement being held in storage for the spring trade. It is estimated the loss amounted to over $10,000, and the value of the property saved was in excess of $75,000.

David Hinckley, 60 years old, of Kingston, an experienced drill runner and powder man was killed recently in a premature blast in a cut at the stone quarries of the Acme Cement Corporation.

The Tidewater Portland Cement Co., recently applied for a lower freight rate on bituminous coal. The arguments were presented in a meeting held in Baltimore. A decision is expected within the next few weeks.

The cement plant at Chelsea, acquired by the state and in which convict labor is employed, is turning out about 4000 bbls. of cement per day. It was originally planned to have the capacity of the plant 500,000 bbls. a year, but it is reported that it will produce upwards of 700,000 bbls. this year, and that if funds can be obtained to increase the facilities, upwards of 1,000,000 bbls. can be turned out a year from now.

The engineering students of the Brooklyn Polytechnical Institute recently made an extensive inspection trip to the various engineering works in Pennsylvania, stopping in Bethlehem for a two-day tour. They will also visit the Lehigh Portland Cement Company's mills where a squad of engineers will take groups of the students through the plant.

The Hudson Valley Portland Cement Co., originally the Alsen Cement Co., recently went into involuntary bankruptcy, no statement of assets or liabilities being filed.

William R. Dunn, works manager, of the Vulcanite Portland Cement Co., Phillipsburg, N. J., has recently joined The Engineers' Club of the Lehigh Valley.

All the cement plants in the Lehigh Valley region are preparing for a record summer trade. The Bath Portland Cement Co., which made a record of a million barrels in 1923 is going to keep this record, if not better, says Fred B. Franks, manager. The Pennsylvania plant near Bath has spent over $250,000 in improvements during the year and the Atlas company with four plant units, started on a spring rush several weeks ago.

The annual report of the Coplay Cement Mfg. Co., as given by Herbert E. Steiner, president of the company, showed a production of 1,600,000 bbls. of cement during 1923, with a financial turnover of $3,000,000. Prices for cement were approximately the same as a year ago with industrial, fuel and transport conditions reported as fair. The company's mills at Coplay have been in continuous operation throughout the winter.

Norman Waford, who built the Superior Portland Cement Co.'s plant several years ago, has just arrived at Elizabethville, Belgian Congo, where he is preparing to erect a plant for the Quigley, Fiels Syste's Inc., of New York, according to a letter recently received by friends in Bellingham, Wash.

It is being rumored that Catskill, N. Y., may have a new cement plant. New York capitalists have been doing a vast amount of prospecting in that section where they have secured options on more than a thousand acres of quarry land. Options on waterfronts have been secured, rights of way have been obtained, a consignment of drilling machinery has recently arrived, and from present indications, it would seem the project is assured.

The Edison Portland Cement Co., recently suffered a loss by fire, estimated to be $200,000, which completely destroyed two frame buildings 150 ft. long and 60 ft. wide, which included two packing houses, the bag house and the cooper shop. The origin of the fire remains a mystery. Plans for reconstruction have already been started and it is anticipated that permanent buildings will be built at once and shipments resumed in a short time.

The Phoenix Portland Cement Co., at North Birmingham, Ala., and the Lehigh Portland Cement Co., at Tarrant City, Ala., are each shipping 1000 bbls. of cement a day to Muscle Shoals government work, on the Tennessee river, near Sheffield, Ala.

The cement industry has become one of the most active industries in the Birmingham, Ala., district and future prospects are that all the plants will be kept operating at capacity for some time to come.

More cement is going into buildings, roadways, bridges and other construction work in Alabama at the present time than was ever known before and the demand for cement for this work is on the increase constantly, according to contractors and builders.

The new bag house being erected by the Giant Portland Cement Co., Egypt, Pa., is nearly completed.

Bituminous coal continues to arrive at the mills of the cement companies around Coplay, Pa. The fuel has been received in unprecedented quantities and indicates preparation for great activity during the year, or buying for storage because of low prices, or both.

Isaie Le Plante, president of the National Cement Co. at Montreal, Que., died February 11 at Fall River, Mass., at his home, after an operation at one of the local hospitals. Mr. Le Plante was one of the most prominent French Canadians in New England. He was police commissioner of Fall River at the time of his death, a prominent grain merchant of Fall River and connected with numerous other local industries.

The Western Ohio Portland Cement Co., Germantown, Ohio, has been incorproated with F. E. Dodge, managing engineer.

It is reported from Portland, Ore., that 10,000 tons of cement will be imported from the Orient bearing the brand of the Cebu Portland Cement Co. on the sacks.

An estimated tonnage of 80,000 tons of rock was loosened recently by a blast set off at the quarries of the Tidewater Portland Cement Co. Eight and a half tons of dynamite were exploded. The tunnel system of blasting was used whereby the entire explosive force was in the bottom.

Eldin O. Beahm, a well known resident of Northampton and quarry foreman for the Lawrence Portland Cement Co. died a short time ago from injuries resulting from a fall of about 60 to 80 ft. in the quarry.

T. R. Harrison has assumed charge of the Research Department of The Brown Instrument Co., Philadelphia, Pa. Mr. Harrison was formerly associated with the Pyrometry Department of the Bureau of Standards and more recently with the Champion Porcelain Co. of Detroit.

Owing to a change in freight rate, the price of Universal portland cement at Toledo, Ohio, effective April 15, was changed from 60c per sack to 61¼c per sack.

The Kelley Island Lime & Transport Co. has started to rebuild its plant near Huntington, Ind., with concrete and steel. All wooden kiln sheds and all inflammable material are being replaced by concrete and steel construction. A. C. Shultz, company engineer from the main office at Cleveland, is supervising the construction work.

Among the improvements to be made at the kilns will be a steel tower and tank, a new hydrating lime unit, new conveyor system and new mill equipment. It is estimated that after the work is completed, the plant will double its present output of 100 tons of hydrated lime a day.

The property of the Choctaw Portland Cement Co., Hartshorne, Okla., has been purchased by the banks of Tulsa, Okla., large holders of preferred securities as well as large unsecured creditors of the bankrupt company. It is anticipated that the plant will not be operated again as a cement plant at Hartshorne, its present location, as it was bought with the full purpose and intention of moving such equipment as could be used in an up-to-date plant to Tulsa County. Operations will be continued at the present quarry.

The Macdonald Engineering Co., of Chicago, Ill., has just received a contract from the Peerless Portland Cement Co. to build a stockhouse, two packing plants and a bag house at the Peerless Co.'s new Detroit mill. The contract includes the furnishing of all equipment and electrical work complete.

The Superior Portland Cement Co. is preparing to erect a rock storage building, which will be located immediately east of the cement plant at Concrete, Wash. The contract has been awarded to the Rounds-Clist Co., of Seattle. The building will be of reinforced concrete, and will be 80 x 250 ft. in size. It will be equipped with the latest machinery for the handling of rock, including electric cranes and other machinery. The estimated cost is given as $75,000.

The Allis-Chalmers Mfg. Co. has purchased the power, mining, and cement machinery business of the Worthington Pump and Machinery Co. The Cudahy, Wis., branch of the business, patterns, and parts for this equipment have been taken over by the Allis-Chalmers Co.

H. L. Broadwater has been made assistant superintendent at the plant of the Tidewater Portland Cement Co., Union Bridge, Md.

The formal opening of navigation from the upper lakes to Detroit by the arrival on April 26 of the new steel freighter, John W. Boardman, which was launched last fall at the yards of the Toledo Shipbuilding Co., was reported in the Detroit marine notes. The steamer is owned and operated by the Huron Transportation Co., a subsidiary of the Huron Portland Cement Co. The Boardman arrived at the Detroit plant of the Huron Portland Cement Co., foot of Riopelle St., with a cargo of bulk cement with which she cleared from the company's plant at Alpena.

The vessel was built for use exclusively as a bulk cement carrier, and is known in shipping circles as the most unique carrier on the great lakes. Her cargo when delivered at the company's Detroit storage and distributing plant and there packed in bags to be delivered to construction industries of Detroit, will represent about 125,000 bags of high grade Huron portland cement, arrival of which will contribute toward maintaining construction industries of Detroit at a high peak of activity.

Effective March 1, the price of Universal portland cement at Detroit was changed from 59½¢ per sack to 60¢ per sack and the price at Cleveland from 60¼¢ per sack to 59¾¢ per sack. These changes in price were due to change in freight rates and prices are net to the contractor or consumer, f. o. b. point named, exclusive of package.

Operations at the Bellingham plant of the Olympic Portland Cement Co., have increased to the point where it is necessary to import lime rock from Concrete, Wash., according to a report from Bellingham. The company shipped 4400 bbls. of cement to Honolulu and 1250 bbls. to Alaska. The cement market is reported in good condition and the company expects to do a big business this year, producing 2000 bbls. daily.

About the first of this year, the Superior Portland Cement Co. took out group life insurance covering the employes of the company. Under the group plan used by the Superior company, any person who has been in the employ of the company for 6 months is entitled to take out insurance to the amount of $1,000 with $200 additional for each year of service with the company and with a maximum of $2,000. For this insurance, there is deducted from the wages of the employe insured, the sum of 50¢ a month regardless of the amount of the policy. Every eligible employe has the option of saying whether or not he wants the insurance but the plan is so attractive to the workmen, many of whom are engaged in hazardous work, that practically every man on the payroll who has been in the employ of the company for the required time is carrying the insurance.

The Globe Portland Cement Co. has changed the location of its plant before going ahead to the completion of the project.

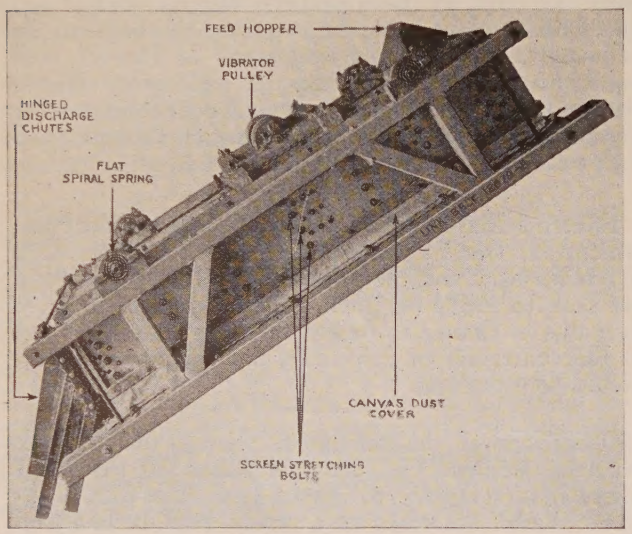
Link-Belt Puts Out New Vibrating Screen

A novel screen for fine separation has recently been put on the market by the Link-Belt Co., of Philadelphia.

The necessity for effective and thorough screening of many fine materials has long been recognized and this screen, which is known as the Link-Belt vibrating screen has been developed to meet these rigid requirements.

It is cited by the Link-Belt company that heretofore agitation of the screen surface has been obtained by a rapid series of rigidly imparted blows, in some cases through mechanical, but preferably electrical devices, and that it is obvious that this results in lack of uniformity over the screening surface, the vibrations being more intense on those portions of the screen nearest the points of impact of the agitators.

Vibrations of the Link-Belt screen are produced by the action of an unbalanced pulley supported on the screening frame and rotated at high speed. Every portion of the screen surface is vibrated uniformly, with the result that the entire surface is utilized for its most effective work.



THREE-DECK LINK-BELT VIBRATING SCREEN

The Link-Belt vibrating screen is the invention of Prof. G. A. Overstrom, a widely-known mining engineer, who was for many years Dean of the Utah College of Mining, and there was brought into intimate contact with the problems of fine ore concentration.

This device is finding an extensive use in the screening of by-products coke, gypsum, cement, fertilizers, coals, pigments, chemical products,—in a wide range of industries, in fact. It effects thorough screening through the finest mesh of any product that can be screened, according to the manufacturers, and is marked by extreme simplicity.

New Line of Air Motor Hoists

The Ingersoll-Rand Co., New York City, is now offering a line of new air motor hoists including five different sizes with capacities ranging from 500 lbs. to 10,000 lbs.

The new hoists are designed to meet a wide range of service and are used in all manner of industries, where rapid and economical lifting and handling of loads is desired.

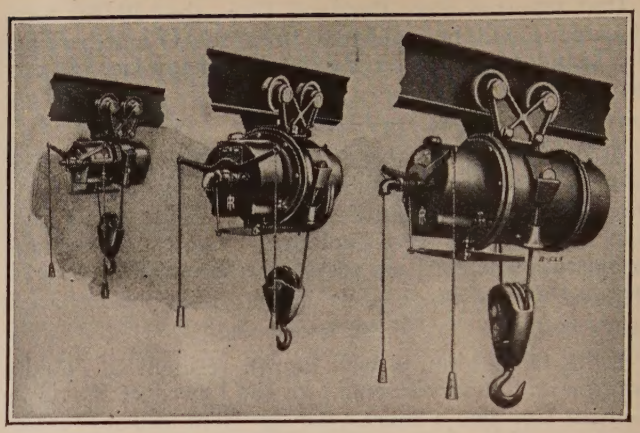


FIG. 1—THREE OF THE FIVE SIZES OF INGERSOLL-RAND AIR MOTOR HOISTS

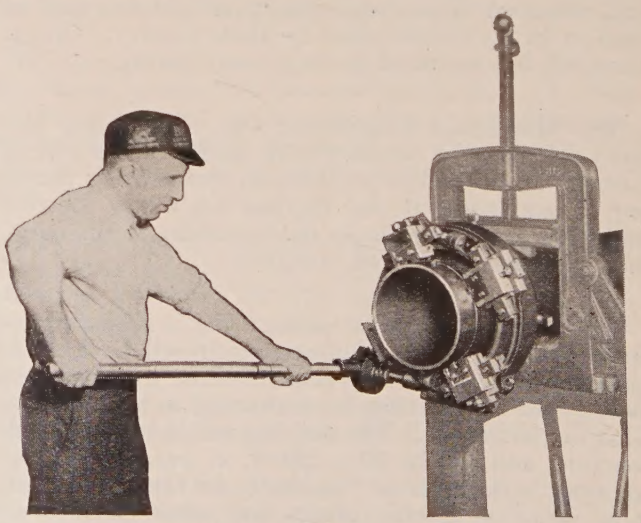
The outstanding characteristics claimed for the new hoists are briefly as follows: compactness of design resulting in low head room required and relatively light weight; automatic brake which positively holds the load under all circumstances—even if the air supply be disconnected or fail; and a graduated throttle which permits a very close regulation of both the lifting and the lowering speeds.

A balanced three cylinder air motor is used which operates in either direction and without vibration at any speed or load within the rated capacity of the machine. Some of the advantages claimed for this motor are its freedom from vibration, the ready manner in which it can be throttled down slowly at all loads and its remarkable absence of lubricating troubles, even when subjected to considerable neglect.

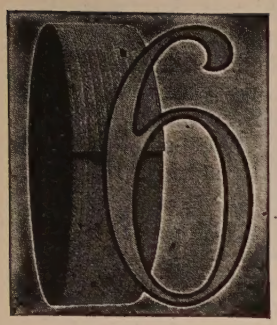
Beaver Square-End Pipe Cutter

The accompanying illustration shows one of the large sizes of Beaver square-end pipe cutters manufactured by the Borden Co., Warren, Ohio. These large sizes carry the range from 2½ in. to 12 in. While the same knife construction and automatic feed are maintained in the large sizes, the driving finish remains stationary—rotating the cutting knives by means of an enclosed worm gear. Either the hand ratchet, as shown, or power may be used.

Beaver square-end cutters are made in all sizes from ⅛ in. to 12 in.



LARGE SIZE BEAVER SQUARE-END PIPE CUTTER

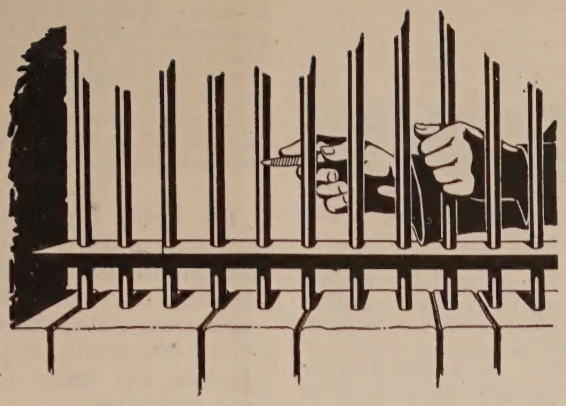


SIX Years at Hard Labor—

200 cubic yards of sand per day, 5½ days per week, from early May to late November, part of the belt exposed to the weather, and the entire housing far from weatherproof: The record of six years service made by Gandy Belt on this Jova Brick Works conveyor, is a real example of belt life.

Six years of service under these conditions is something for us, as manufacturers, to be proud of. Many belts would have done well if they had lasted even three years.

Proof that Mr. Jova realizes he received real service, is shown by his order for a new Gandy to be installed on this conveyor this spring.



YOU CAN'T BREAK JAIL WITH A NAIL FILE!—And the "coefficient of *in*efficiency" is just as high when you attempt to do a regular out-and-out Stitched Cotton Duck Belt job with even the best rubber or leather belts. Stitched Cotton Duck Belt is most emphatically *not* a substitute! It is specifically designed to resist steam, oil, abrasives and every-day out-door weather—the very conditions which render other belts inadequate for certain installations. We do not set up Gandy Belt as a universal do-all, but we do ask you to catalog it in your mind as standard for conveyors, elevators and large drives where such conditions as those mentioned above must be overcome.

THREE TYPES: Gandy Stitched Cotton Duck Belting, for ordinary indoor work. Thermo-Gandy, specially treated for outdoor installations and extremes of heat, cold, steam, etc. Gandy Wax-Impregnated Belt; white, washable, for conveying food products in bulk.

TRADE MARK GANDY'S AMERICAN COTTON DUCK BELTING REG. U.S. PAT. OFF

GANDY

The name "Gandy" is not a generic term covering all Stitched Cotton Duck belt. It is the trade marked name designating *only* the product of the Gandy Belting Company of Baltimore, Maryland, who originated this type of belting in 1880. Gandy Belt is distinguished by the green edge and the Gandy trade mark.

THE GANDY BELTING COMPANY

762 WEST PRATT STREET
BALTIMORE, MARYLAND
NEW YORK - CHICAGO

Trade Publications

The course in chemical engineering and graduate courses in general chemical engineering, metallurgical engineering, gas engineering, and organic chemical industries are announced in a *University Bulletin* just issued by the University of Michigan. Special laboratories contain rather unusual facilities, among which are included: the cement laboratory, which is equipped with a small rotary kiln and other apparatus for burning portland cement under controlled conditions and for testing the properties of cement. The work is in charge of Alfred H. White, professor of chemical engineering, University of Michigan, Ann Arbor, Mich.

The Davenport Locomotive Works, Davenport, Iowa, has just issued a folder describing and illustrating its Davenport gasoline locomotives. It is claimed for these locomotives that all bearings, gears, and driving chains, including the final driving chains, are completely encased and perfectly lubricated. No working parts are exposed to grit or dirt. The Davenport locomotive uses roller chains and sprockets instead of gears in the transmission, all completely encased and flooded with oil; has an individual wheel drive which makes derailment almost impossible; heavy Timken bearings and perfect lubrication; and is in direct drive at any speed. Complete catalogs will be sent to anyone interested upon request.

The Metals Coating Co., of America, Philadelphia, Pa., has recently issued a 16-page booklet describing and illustrating the *MetaLayeR Schoop Process*. This process and apparatus, according to the manufacturers, simultaneously melts, atomizes, and applies coatings of any of the commercial metals to any surface. It applies, either in the shop or in the field, a coherent attached or separable coating of any of the commercial metals on any substance, whether inflammable, vitreous, fibrous, metallic, conducting or insulating, regardless of size or location. The booklet is 9 in. x 12 in., with 16 pages fully illustrated, and will be mailed to anyone interested, upon request.

A Compendium of Reinforced Concrete has been received from Wilsons New Zealand Portland Cement Co., Ltd., Auckland, New Zealand. The book prepared by G. Siacci and S. I. Crookes, Jr., contains fundamentals, formulae, tables and examples and is a handy up-to-date little book on reinforced concrete. It is published by Leightons, Ltd., Auckland, N. Z.

It was the intention of the authors to explain in simple and precise language how problems which would take hours of labor to solve by using a treatise may be solved in a few minutes with the maximum permissible accuracy. Numerous tables are included and useful data and many examples are worked out all through the volume. Among the subjects which receive special attention, is the American flat slab construction.

The book is intended to be of special value to the non-mathematical man and will undoubtedly also be of practical assistance to architects, as well as engineers.

The Celite Products Co., of Chicago, has recently instituted a novel method of distributing engineering data on its heat insulation products. For the convenience of engineers who may use that form of engineering data, the company has reproduced many of its blueprints and charts in Lefax size sheets, punched and ready for insertion in standard Lefax loose-leaf binders.

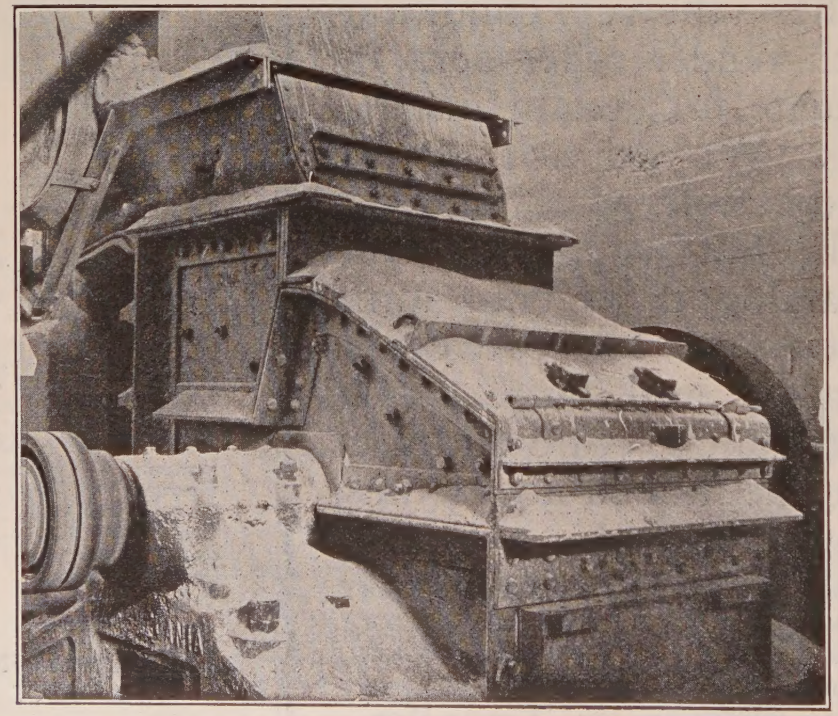
These include charts showing comparative conductivities of Sil-O-Cel brick, red brick and refractories, as well as heat losses through various wall constructions, insulated and uninsulated, and drawings showing methods of insulating such equipment as boilers, furnaces; ovens; brick, lime and cement kilns; gas equipment; glass equipment; oil stills, etc.

A new cement plant is to be built in Afghanistan with machinery furnished by the Krupp Grusonwerkes of Magdoburg, Germany. At the beginning, the mill will be a more or less experimental one with a capacity of 3600 tons per year. Later on it is projected to build a larger plant with four or five furnace kilns.

The raw materials, lime and clay, are found in great quantities in Afghanistan, but the question of fuel for burning has yet to be solved.

WANTED—Two good general cement plant repairmen. Georgia Cement & Stone Co., Portland, Pa.

"PENNSYLVANIAS" FOR SUPER SERVICE



THIS "PENNSYLVANIA" SUPER-9 is reducing large Limestone and Cement Rock in a Mid-West Cement Plant for feeding a "Compartment Finishing Mill." The photograph required 1½ minutes exposure, and was taken with Crusher running under full load.

Note complete absence of vibration.

Battleship frame construction; massive all-Steel rotor, Manganese Steel internal equipment and patented Tramp Iron Separator insure SUPER service for "Pennsylvania" Steelbuilt Hammer mills.

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